Washington Advisory Committee DRAFT

BERKSHIRE REGION REPORT

for the

MASSACHUSETTS WATER RESOURCES STUDY

A Cooperative River Basin Survey

United States Department of Agriculture

Economic Research Service

Forest Service

Soil Conservation Service

in cooperation with the

Massachusetts Water Resources Commission

October 1976

PREFACE

The United States Department of Agriculture, in cooperation with the Massachusetts Water Resources Commission, is participating in a study of the water and related land resources within the Commonwealth. This report presents the results of that study on the Berkshire Region which consists of the Housatonic and Hudson River drainage areas within Massachusetts.

Major items for this study which are published separately are inventories of potential and existing reservoir sites and an inventory of present land use.

Objectives of this report are to identify problems, needs and alternative solutions in the following resource areas: land use, flooding, erosion and sediment, recreation, fish and wildlife, wetlands, water supply and water quality.

This report prepared by the Soil Conservation Service, Economic Research Service, and Forest Service, is submitted to the Massachusetts Water Resources Commission by the USDA Field Advisory Committee as part of the study. The Massachusetts Water Resources Commission will use this report, together with other reports and studies prepared by the United States Department of Agriculture and others, in the preparation of a comprehensive plan for the Commonwealth's water and land resources.

The information and data contained herein will also assist local, state, and federal agencies in their specific planning activities for the coordinated and orderly conservation, development, utilization, and management of the water and land resources of Massachusetts.

MASSACHUSETTS WATER RESOURCES STUDY

BERKSHIRE REGION

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CHAPTER 1 SUMMARY

1.1 INTRODUCTION

The Berkshire Region, approximately 700 square miles, consists of those lands in Western Massachusetts drained by the Housatonic River; the Hoosic River, a major tributary of the Hudson River; and all other streams which are tributary to the Hudson River. The region is essentially the western two-thirds of Berkshire County. The eastern third of Berkshire County drains into the Connecticut River and will be covered in a later Connecticut River Region report.

This is a report of a study of the water and related land resources of the region prepared by the U. S. Department of Agriculture (USDA) and the Massachusetts Water Resources Commission. There will be similar reports for the remaining regions of Massachusetts. The objectives of this study are to identify problems, determine needs through 1990 and suggest alternatives which will be used by the Water Resources Commission to prepare a comprehensive <u>State Water and Related Land Resources Plan.</u> Information contained in this report will be useful to state, regional and local agencies concerned with land use and natural resource planning.

The Forest Service, Economic Research Service and the Soil Conservation Service are the United States Department of Agriculture (USDA) agencies participating in this study. The Massachusetts Division of Water Resources, the Massachusetts Division of Fisheries & Wildlife, the Massachusetts Division of Forests & Parks, and the Massachusetts Division of Water Pollution Control are the state agencies most actively involved in this study.

1.2 Planning Procedures

Water and related land resource planning by federal agencies is guided by the Principles and Standards (P&S) established by the federal Water Resources Council. These principles and standards establish a thorough and organized approach to resource planning for two broad objectives:

1. National Economic Development (NED)--to enhance national economic development by increasing the value of the nation's output of goods and services and improving national economic efficiency

2. Environmental Quality (EQ)--to enhance the quality of the environment by the management, conservation, preservation, creation, restoration or improvement of the quality of certain natural and cultural resources and ecological systems.1/

The planning process, established by P&S, is designed to produce a recommended plan. The Massachusetts Water Resources Study planning process differs in that the process stops with the development of alternatives. The selection of a final or recommended plan is the responsibility of the Massachusetts Water Resources Commission.

This study investigated the following resource areas:

Land Use
Flooding
Erosion and Sediment
Wetlands
Water Quality
Water Supply and Irrigation
Drainage
Fish and Wildlife
Recreation

Study results are presented in chapters under these resource headings and are organized to reflect the planning process. For each resource area, a four step investigation process was used. These steps were:

1. identify resource base and existing programs
2. determine problems and objectives
3. determine needs which are the difference between objectives and expected conditions without any plan
4. develop alternatives for meeting these needs.

1/Federal Register, Water Resources Council, Water and Related Land Resources, Establishment of Principles and Standards for Planning, Vol. 38, Number 174, Part III, Monday, September 10, 1973, p. 6.

The Massachusetts Water Resources Study planning process approximates the first four steps of the P&S process which are as follows:

1. specify components of the objectives relevant to the planning setting
2. evaluate resource capabilities and expected conditions without any plan
3. formulate alternative plans to achieve varying levels of contributions to the specified components of the objectives
4. analyze the differences among alternative plans which reflect different emphasis among the specified components of the objectives.1/

P&S requires that beneficial and adverse effects of alternatives or plans on National Economic Development and Environmental Quality be displayed. In addition, P&S suggests that beneficial and adverse effects of alternatives be displayed where appropriate for Regional Development (RD), and Social Well-Being (S W-B). Displays showing effects of the alternatives on these four accounts, NED, EQ, RD and S W-B, are presented in Chapter 11, Program Implementation Alternatives.

Chapter 12, Environmental Effects, presents a table of estimated impacts on selected environmental factors for each alternative.

1.3 Findings

Findings in major resource areas are included in the appropriate chapter.

A chapter on drainage is not included, and so our findings are included here. Agricultural drainage needs are adequately handled by the ongoing conservation operations program of the Berkshire Conservation District. Approximately 2,000 acres of agricultural land will need drainage improvements by 1990. Most potential urban drainage problems can be avoided by regulating urban developments on wetland areas and by proper construction in other areas. Municipal officials, in enforcing zoning by-laws and subdivision regulations and building codes, review urban development proposals for adequacy of

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1/Federal Register, Water Resources Council, Water and Related Land Resources, Establishment of Principles and Standards for Planning, Vol. 38, Number 174, Part III, Monday, September 10, 1973, p. 13.

proposed drainage measures before approval of these proposals. At this time, these officials can require that adequate systems be installed.

Table 1.1, Problems and Other Findings of the Study, summarizes study findings, significant problems, and potential solutions to these problems.

1.4 Conclusions

The 1970 population of the region was about 145,400 people. The population is expected to increase 11 percent to about 161,500 people by 1990. This is substantially below projections of statewide population growth and indicates that the region will remain one of the more rural areas of Massachusetts. The region will continue to attract tourists and other recreationists because of its aesthetic appeal, abundant natural resources and accessibility to urban centers of the Northeast. Maintenance of the region's environmental quality and recreational resources will have significant economic benefits for the region.

There is potential to increase agricultural production, expand the timber industry, provide more recreation facilities, reduce flood damages and solve many of the problems in the region through the application of USDA programs.

A watershed investigation report is being prepared which addresses the flooding problems of the Upper Housatonic River Basin. This area has potential for implementation under the Watershed Protection and Flood Prevention Act (Public Law 83-566).

One of the objectives of the Berkshire-Franklin Resource Conservation and Development Project, established in 1970, is to improve environmental quality through optimum use of natural resources. This project is particularily suited to respond to needs in agriculture, forestry, recreation and erosion control.

Chapter 11, Program Implementation Alternatives, provides information on USDA programs which may be of benefit to the region.

MASSACHUSETTS WATER RESOURCES STUDY - BERKSHIRE REGION

Table 1.1 Problems and Other Findings of the Study

Resource Area	Findings/Problems	Potential Solutions	Program Opportunities	
			USDA	Other
1. Land Use	1. Agricultural land acreage has declined 26% from 1952 to 1972 and is projected to decline further.	1. Develop programs that help maintain agricultural land use.	Identify prime agricultural lands (Soils).	Farm management and farm account work at U.of Mass. and with Cooperative Extension Service.
	2. Forest land (approximately 70% of the region) is under-utilized.	1. Increase utilization of forest products. 2. Manage forest resource for increased production of timber products. 3. Manage forest lands for multiple uses.	1. Berkshire-Franklin RC&D project. 1. Renewable Resources Program. (USDA-Forest Service & Mass. Div. of Forests & Parks).	
		4. Preserve existing forestlands.		1. Financial assistance for communities for acquision. Mass.-Self-Help Fund, General Laws, Ch. 132A, Sec. 11, Federal - USDI, BOR - Land & Water Conservation Fund.
2. Flooding	1. Future urban flood plain development is expected to be highly restricted.	1. Enroll towns not now in National Flood Insurance Program.		1. HUD National Flood Insurance Program.
	2. Average annual flood damage to existing development exceeds $800,000.	2. Implement plans for structural measures and flood proofing to reduce flood damages.	1. PL 83-566, Watershed Protection & Flood Prevention Act, and administered by USDA, SCS. 2. Berkshire-Franklin Resource Conservation & Development Project	

MASSACHUSETTS WATER RESOURCES STUDY - BERKSHIRE REGION
Table 1.1 Problems and Other Findings of the Study

Resource Area	Findings/Problems	Potential Solutions	Program Opportunities	
			USDA	Other
3. Erosion and Sediment	1. Erosion on construction sites is an important erosion problem.	1. Develop erosion and sediment control ordinances at the municipal level.	1. Conservation Operations Program, USDA, SCS.	1. Technical assistance from Berkshire Conservation District with inputs from Cooperative Extention Service and Berkshire County Regional Planning Commission.
	2. Region has 750 acres of critical erosion problem areas and 57 miles of problem streambanks.	1. Develop Resource, Conservation & Development project measure to stabilize critical areas and problem streambanks.	1. Berkshire-Franklin RC&D Project.	
4. Wetlands	1. Region has 21,800 acres of wetlands which should be protected from harmful alteration.	1. Enforce Mass. Wetlands Protection Act, G.L. 131, Section 40. 2. Prepare large scale wetlands maps.		
	2. 8,000 acres of wetlands are of regional importance.	1. Acquire additional 2,000 acres within the regionally important wetlands by 1990.		1. Financial assistance for cities and towns for acquisition, state - Self-Help Fund, G.L. Ch. 132A, Section 11. Federal - USDI - BOR Land and Water Conservation Fund.

MASSACHUSETTS WATER RESOURCES STUDY - BERKSHIRE REGION

Table 1.1 Problems and Other Findings of the Study

Resource Area	Findings/Problems	Potential Solutions	Program Opportunities	
			USDA	Other
5. Water Quality	1. Ongoing programs on verge of reestablishing high water quality in the streams of the region. 2. "Section 208" water quality study underway for Pittsfield and eight adjacent towns.			
	3. Detailed soil survey information is not available for entire region.	1. Provide detailed soil survey.	1. Special soils surveys and interpretations to be prepared for towns by SCS.	
	4. Lake water quality needs protection and/or improvement.	1. Develop a lake water quality protection program.		
6. Water Supply and Irrigation	1. Additional 4.6 million gallons per day. Municipal water supply will be needed by 1990.	1. Additional water supply can be developed from ground water and/or surface water sources.	1. USDA Farmers Home Administration loans for community water supply systems.	1. HUD loans and financial assistance for municipal water supply.
	2. Little irrigation water use; existing programs are adequate.			

MASSACHUSETTS WATER RESO' ES STUDY - BERKSHIRE REGION

Table 1.1 Problems and Other Findings of the Study

Resource Area	Findings/Problems	Potential Solutions	Program Opportunities: USDA	Program Opportunities: Other
7. Drainage	1. Existing programs are adequate for agricultural drainage needs.			
8. Fish & Wildlife	1. In comparision with other regions of Mass., the Berkshire Region has a relative abundance of fish and wildlife resources.			
	2. Fishing demand is greater than supply available to the public.	1. Provide more public access to fishing areas.		Mass.- Public Access Fund, General Laws Chapter 21, Section 17.
	3. Wildlife resource management should include 3.1 Land use management for habitat diversity.	1. Manage land to provide a diversity of wildlife habitats.	1. Conservation Operations Program - USDA - SCS 2. Renewable Resources Program - USDA - FS & Mass. Division of Forests & Parks.	1. Technical assistance from Berkshire Conservation District.
	3.2 Acquisition of additional wildlife lands. 3.3 Protection of outstanding wildlife resources.	2. Acquire additional wildlife management lands. 3. Protect outstanding or unusual wildlife resources.		1. USDI - BOR Land and Water Conservation Fund. 2. Mass. - Self-Help Fund.

MASSACHUSETTS WATER RESOURCES STUDY - BERKSHIRE REGION

Table 1.1 Problems and Other Findings of the Study

Resource Area	Findings/Problems	Potential Solutions	Program Opportunities	
			USDA	Other
9. Recreation	1. By 1990, there will be insufficient camping, picnicking, swimming and boating facilities.	1. Provide additional camping, picnicking, swimming & boating facilities by 1990.	1. Berkshire - Franklin Resource Conservation and Development Project.	1. USDI - BOR Land and Water Conservation Fund. 2. Mass. - Self-Help Fund, GL Ch. 132A, Section 11. 3. Mass. - Public Access Fund, GL Ch. 21, Sec. 17.
	2. Region has numerous unique natural features.	1. Plan for preservation of scenic rivers and unique natural areas.	1. Renewable Resources Program. USDA - Forest Service & Mass. Division of Forests & Parks.	Nature Conservancy Program.

CHAPTER 2 - DESCRIPTION

2.0 GENERAL

The Berkshire Region is located entirely within Berkshire County, the western most county in Massachusetts. The county extends the entire north-south length of the state, from Vermont to Connecticut. On the west, the county is bounded by the New York-Massachusetts border and on the east by the Connecticut River Valley (Franklin, Hampshire and Hampden Counties).

The Berkshire Region is a trough-like area lying between the Taconic Mountain Range on the west (New York border) and the Berkshire Hills on the east (the eastern most towns in the county, with the exception of Washington, are not within the region). The region is further divided into two study areas, the Hudson and the Housatonic.

The Housatonic Study Area is approximately 502 square miles and is an hydrologic entity in that it covers the entire Housatonic Watershed in Massachusetts (a small portion of New York is tributary to the river in Massachusetts as well). Approximately two-thirds of the Berkshire Region is drained by the Housatonic. The main stem of the river is formed at Pittsfield by the confluence of the East, West and Southwest Branches. From Pittsfield, the Housatonic meanders 130 miles south through Connecticut to its mouth on Long Island Sound.

The Hudson Study Area consists of that portion of the Hudson River Basin located within Massachusetts, covers an area of 203 square miles, and drains approximately one-third of the region. Three subwatersheds drain separately into the Hudson Basin and thus the Hudson Study Area cannot be considered one hydrologic entity within Massachusetts.

The Hoosic River with its source in Massachusetts is the largest of the three sub-watersheds and drains nearly 76,000 acres. Although it flows through mostly rural areas, it does intersect the urban areas of Adams, North Adams and Williamstown.

The North and South Branches join in North Adams to form the main stem Hoosic River. As the river leaves Williamstown it flows through Vermont before joining the Hudson River at Stillwater, New York. Kinderhook Creek and Bashbish Brook, the other two subwatersheds, drain considerably smaller areas of 13,000 and 9,500 acres, respectively.

Areas of municipalities within the hydrologic boundaries of the region are shown on Table 2-1.

2.1 Physical Data

The Berkshire Hills form the eastern border of the region. Topography varies from rugged and irregular to moderately sloping near the ridge tops. The hills are characterized by a deeply dissected plateau with elevations between 1,100 and 2,200 feet. In the north a few rough hills rise above the plateau to elevations up to 2,770 feet above sea level.

The Berkshire Valley runs north and south between the Taconic Mountains and the Berkshire Hills. This area consists of the Housatonic and the Hoosic River Valleys, which are divided by a number of isolated ridges and mountains. One of these is Mt. Greylock, the highest point in the state at 3,491 feet above sea level. The topography of the valleys is relatively smooth with elevations ranging from 550 to 1,100 feet. Figure 2-1 depicts Berkshire County, the Region and Study areas.

Soils

The soils in the region have been formed from glacial till or outwash deposits. Wide differences in soil characteristics have resulted because of the great variety of parent materials and slope characteristics, although climatic and vegetative conditions were similar. Soils are generally less sandy than those in the eastern part of the state. A general soils map for the region is shown in Figure 2-2. Descriptions of the eleven soils associations of this region are shown on this figure.

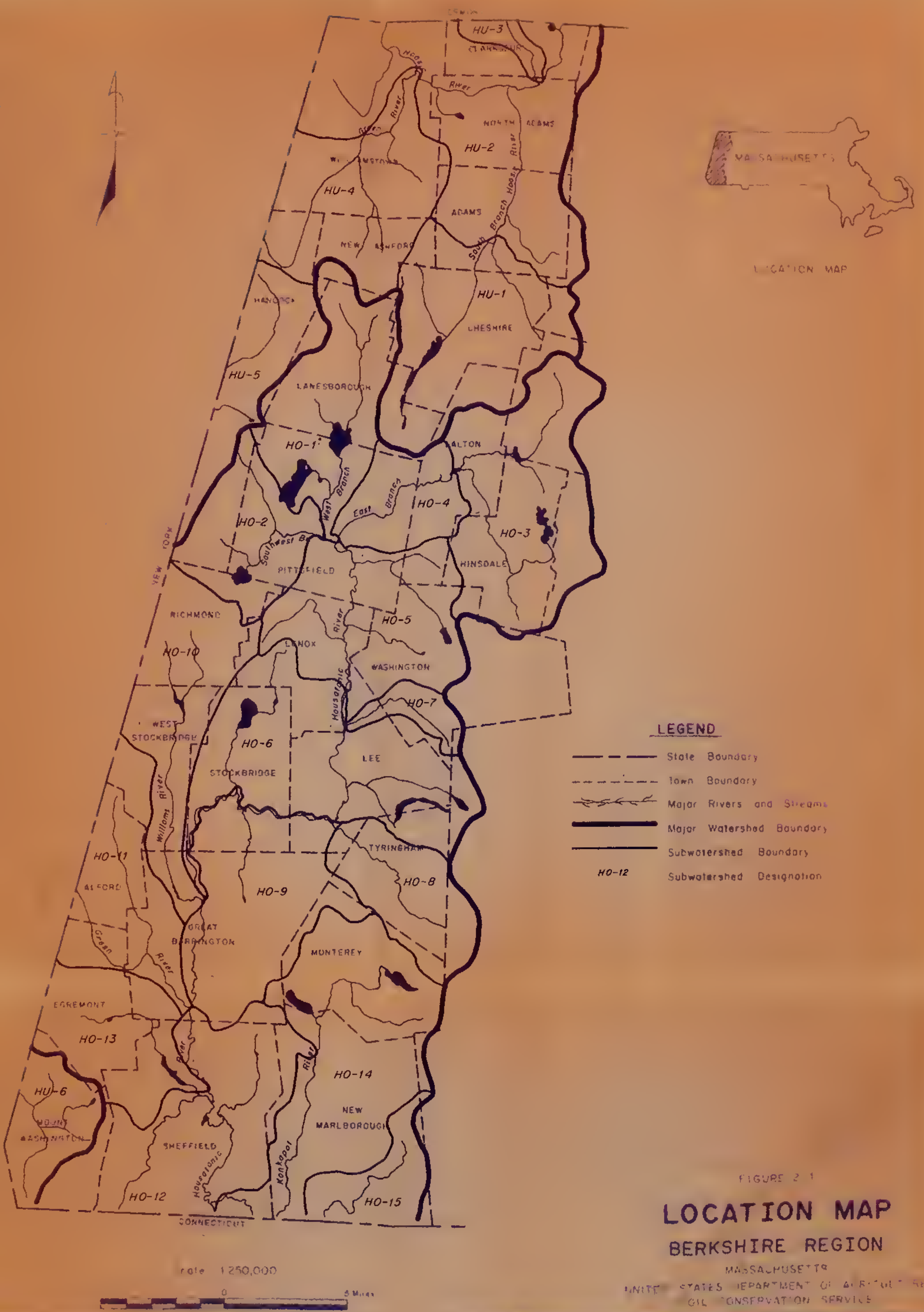


FIGURE 2.1

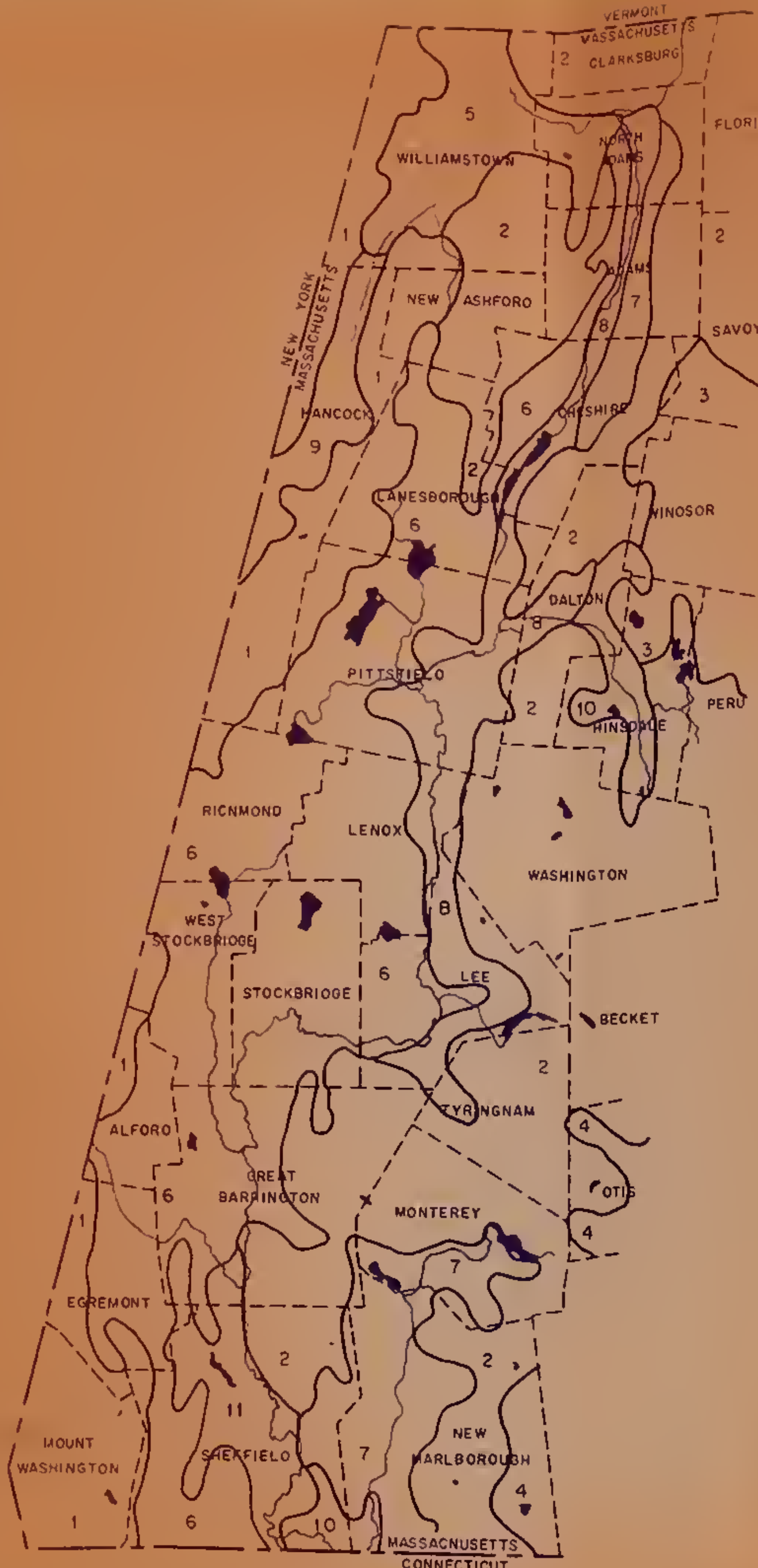
LOCATION MAP

BERKSHIRE REGION

MASSACHUSETTS

UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE



Scale 1 325,000

5 0 5 10 Miles

LOCATION MAP

SOIL ASSOCIATIONS

1 — NASSAU–BERNARDSTON–DUTCHESS ASSOCIATION
Hilly to very steep, rocky, strongly acid, shallow to bedrock soils; also non–stony to extremely stony, deep, well–drained, silty soils mostly with hardpan

2 — LYMAN–PERU–MARLOW–BERKSHIRE ASSOCIATION
Hilly to steep, rocky very strongly acid soils that are shallow to bedrock; also non–stony to extremely stony, deep, moderately well drained and well drained loamy soils with hardpan

3 — WESTMINSTER–MARLOW, DARK SUBSOIL–PERU ASSOCIATION
Hilly, rocky, strongly acid, shallow to bedrock soils, and deep, non–stony to extremely stony, well drained and moderately well drained loamy soils with hardpan

4 — LYMAN–MUCK–RIDGEBURY ASSOCIATION:
Steep, rocky, strongly acid, shallow to bedrock soils, level to nearly level, very poorly drained, organic soils; and level to gently sloping or rolling, poorly drained, extremely stony loamy soils with hardpan

5 — AMENIA–STOCKBRIDGE–RHINEBECK ASSOCIATION
Rolling, non–stony and very stony, moderately well drained and well drained calcareous, silty soils with hardpan.

6 — AMENIA–STOCKBRIDGE–PITTSFIELD ASSOCIATION
Rolling, non–stony and very stony, moderately well drained and well drained, calcareous, silty soils with hardpan, also mostly very stony, well drained, calcareous, loamy soils without hardpan

7 — PITTSFIELD–AMENIA–KENDAIA ASSOCIATION
Rolling, non–stony to very stony, ledgy, well drained to poorly drained, calcareous, loamy soils without hardpan

8 — COPAKE–WINOOSKI–HERO ASSOCIATION
Level to gently rolling, well drained and moderately well drained, calcareous, loamy and gravelly soils on terraces, and moderately well drained, silty soils on flood plains

9 — WARWICK–SUDBURY–PITTSFIELD ASSOCIATION
Undulating to gently rolling, well drained and moderately well drained, acid, loamy and gravelly soils on terraces, also non-stony to very stony calcareous loamy soils on low, smoothly rounded hills and ridges.

10 — HINCKLEY–WINDSOR–MERRIMAC ASSOCIATION
Level to gently rolling, excessively drained, strongly acid, sandy and gravelly soils on terraces

11 — HADLEY–WINOOSKI–LIMERICK ASSOCIATION
Level to nearly level well drained to poorly drained, silty soils on flood plains.

LEGEND

STATE BOUNDARY

TOWN BOUNDARY

MAJOR RIVERS AND STREAMS

PONDS AND RESERVOIRS

FIGURE 2-2

GENERAL SOIL MAP

BERKSHIRE REGION
MASSACHUSETTS
UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

TABLE 2-1 - AREA OF MUNICIPALITIES WITHIN
HYDROLOGIC BOUNDARIES OF THE REGION

TOWN/CITY1/*	Area2/ Acres	Square Mile	Percent of Town
Housatonic Study Area	321,248	501.95	xx
*Alford	7,396	11.56	100.0
Becket	2,316	3.62	7.6
Cheshire	59	0.09	0.3
*Dalton	11,594	18.12	82.7
*Egremont	12,075	18.87	100.0
*Great Barrington	29,327	45.82	100.0
Hancock	5,991	9.36	26.0
*Hinsdale	14,032	21.92	100.0
*Lanesborough	13,841	21.63	73.0
*Lee	17,275	26.99	100.0
*Lenox	13,884	21.69	100.0
*Monterey	17,235	26.93	98.8
Mount Washington	4,742	7.41	33.2
New Ashford	636	0.99	7.4
*New Marlborough	29,739	46.47	96.8
Otis	2,160	3.38	8.9
Peru	5,291	8.27	31.8
*Pittsfield	27,137	42.40	99.8
*Richmond	11,983	18.72	98.4
Sandisfield	734	1.15	2.2
*Sheffield	31,130	48.64	100.0
*Stockbridge	15,130	23.64	100.0
*Tyringham	12,048	18.82	99.6
*Washington	15,924	24.88	64.3
*West Stockbridge	11,947	18.67	100.0
Windsor	7,622	11.91	34.0
Hudson Study Area	129,981	203.10	xx
*Adams	14,412	22.52	98.2
*Cheshire	17,547	27.42	99.7
*Clarksburg	8,207	12.82	100.0
Dalton	2,417	3.78	17.3
Florida	809	1.26	5.1
*Hancock	17,071	26.67	74.0
Lanesborough	5,107	7.98	27.0
*Mount Washington	9,549	14.92	66.8
*New Ashford	7,985	12.48	92.6
*North Adams	12,536	19.59	95.0
Pittsfield	41	0.06	0.2
Richmond	198	0.31	1.6
Savoy	2,629	4.11	11.4
*Williamstown	29,905	46.73	100.0
Windsor	1,568	2.45	7.0
Regional Total	451,229	705.05	xx

1/ Cities are underscored.
* Municipalities designed to represent the study area.
2/ These measurement figures differ slightly from those presented in Chapter 3, Land Use.

Geology

The surficial, or unconsolidated, geologic materials are mainly the result of glaciation. The glacial ice generally covered the higher ridges and hills with an assorted mixture of silt, sand, gravel and boulders known as glacial till. The till deposits are generally a few feet in thickness, very dense and compact, and are often locally referred to as "hardpan." The glacial till usually provides a good foundation where soil strength and water tightness are important criteria. The till is also a good source of impervious borrow, once the large boulders are removed. Fresh exposures of the till in road-cuts or other excavations are susceptible to loosening and heaving by frost action.

When the glaciers melted, the resulting meltwater streams deposited mounds, terraces and plains of sand and gravel. These deposits generally occur in the larger valleys, such as the valleys of the Hoosic and Housatonic Rivers. In the lower areas, the meltwater was trapped and ponded. The resulting glacial lakes were filled by fine-grained, silty soils. The thickness of the glacial lake and stream deposits varies considerably, but thickness of a few hundred feet occur in some localities. The sand and gravel deposits are one of the prime natural resources of the area. Structures requiring a relatively high degree of soil strength should be founded on the lake silts only with great care. Structures requiring impoundment or retention of water generally will not be successful if founded on the sand and gravel. The thicker sand and gravel deposits offer great potential for groundwater supply.

Many types of bedrock occur in the region, and the geographic distribution of any given rock type is often difficult to predict. However, the bedrock types can be divided into two general categories: (1) metamorphic rocks (quartzites, gneisses, and schists) (2) carbonate rocks (limestones, dolomites, and marbles).

The metamorphic rocks generally are found in the higher hills of the Taconic Range to the west and the Berkshire Hills to the east. These rocks generally are hard and sound, but some of the schists may be soft and weathered locally, particularly in the Taconic Range. Small lenses of cavernous carbonate rocks have been discovered in a few places in both the Berkshire Hills and the Taconic Range. Some of the metamorphic rocks, particularly in the Berkshire Hills, should be a suitable source of crushed stone. Water wells in the metamorphic rocks generally meet with minimal success, except where the well encounters a relatively large zone of fractured, broken rock. These zones are relatively infrequent and difficult to locate. The metamorphic bedrock occurs at the ground surface in many places, but is often buried beneath a few feet of glacial till.

The carbonate rocks are generally found underlying the major valleys. The bedrock is often buried beneath the sands, gravels and silts deposited by the glacial streams and lakes. However, some exposures occur at the ground surface on the small ridges and hills protruding from the valley floor and on the valley walls. The carbonate rocks are susceptible to solution and cavernous conditions are known to occur in some localities; elsewhere, it is relatively sound and water tight. Therefore, the carbonate rocks offer a moderate potential for groundwater supply, but suitable cavernous areas may be difficult to locate. Areas of carbonate rock with relatively large springs may prove to be the best areas to explore for determining the suitability of the bedrock for groundwater supply. Various quarry operations have been mining the higher grade limestone for many years.

Vegetative Cover

The Berkshire Region is 70 percent forested. Distribution of forest cover is shown in Figure 2-3. Maple--beech--birch and oak are the predominant upland forest types covering over 60 percent of the forested area (Figure 2-4). Spruce--fir is found at higher elevaltion. Elm--ash--cottonwood occupies the low wetlands, and is an indication, generally, that a site is poorly drained, swampy or subject to periodic flooding.

Climate

The average annual temperature is approximately 45 degrees Fahrenheit (^{O}F) with an average in January of about $22^{O}F$ and an average in July of about $68^{O}F$. The summers are short and, for the most part cool, with only a few brief periods of hot, humid weather. The length of the growing season averages about 130 days, starting around mid May and extending to the latter part of September.

Mean annual precipitation is approximately 44 inches at Pittsfield with an average snowfall of about 64 inches. The average annual run-off is about 22 inches or nearly 50 percent of the average annual precipitation. Over one-half of the annual runoff occurs in March, April and May with the remainder being rather uniformly distributed throughout the rest of the year.

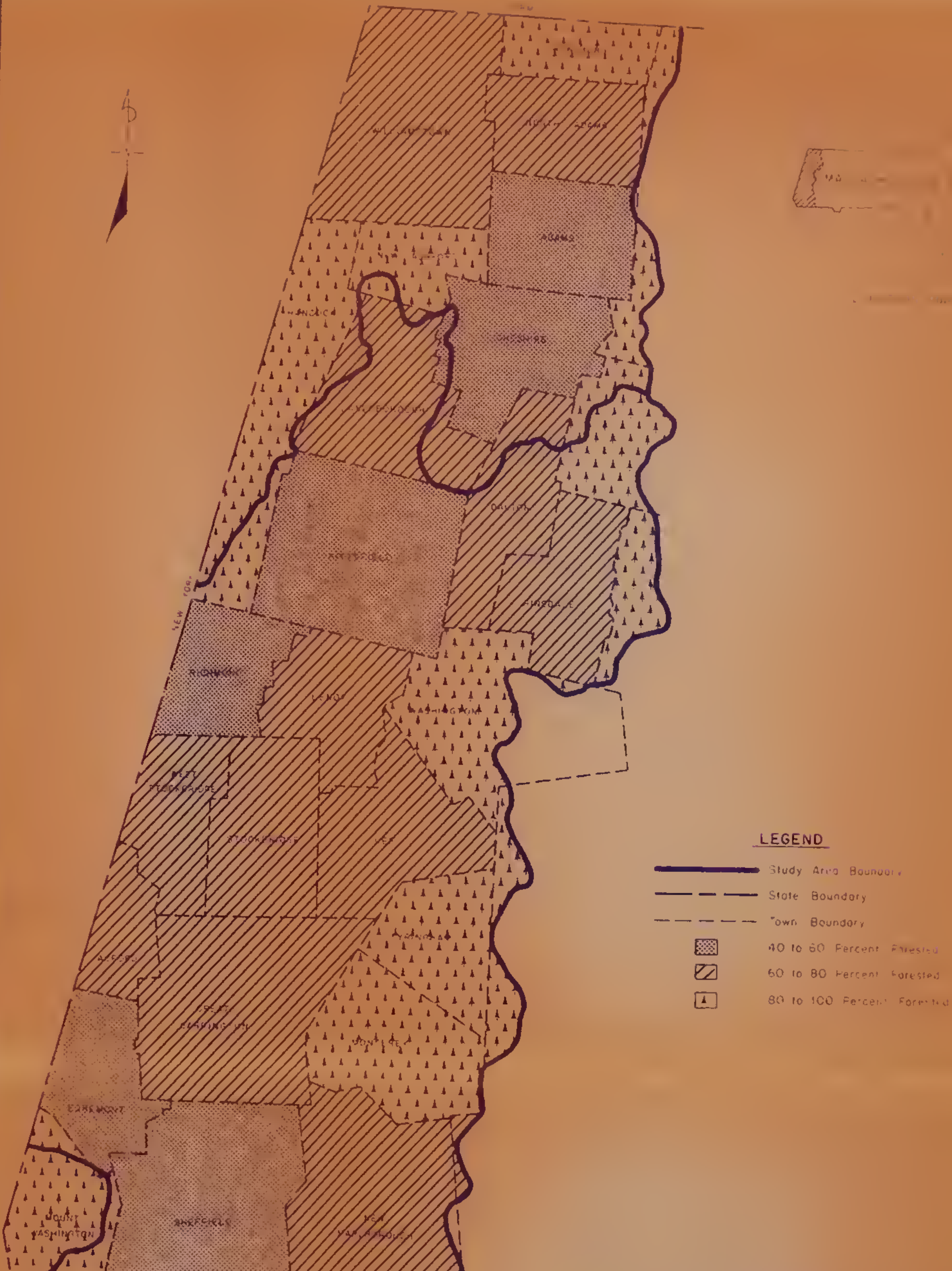
See Figure 2-5, Climatological Data.

Storms and Droughts

Major storms and subsequent floods in this region have occurred at various times throughout the year. In the Housatonic study area significant floods have occurred in May 1854, October 1869, March 1896, November 1927, March 1936, September 1938 and January 1949. The flood of September 1938, was the maximum of record in the upper part of the Housatonic River Basin and the New Year's Day flood of 1949, was the maximum of record in the lower part of the basin in Massachusetts.

Similarly, in the Hudson Study Area the flood of September 1938, was greatest in the upper part of the Hoosic River Basin around Adams and North Adams. In the lower reaches of the Hoosic River the maximum flood of record occurred in December 1948 (New Year's Eve).

Conversely, droughts have occurred with the longest in recent memory extending from 1962 to 1967. At stream gages on the Housatonic River minimum flows have been recorded in October 1914 and August 1936. On the Hoosic River minimum flows have been recorded in August and October 1940, July 1965 and September 1968.



Scale 1:250,000

5 0 Miles

FIGURE 2-3

FOREST COVER DISTRIBUTION

BERKSHIRE REGION

MASSACHUSETTS

UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

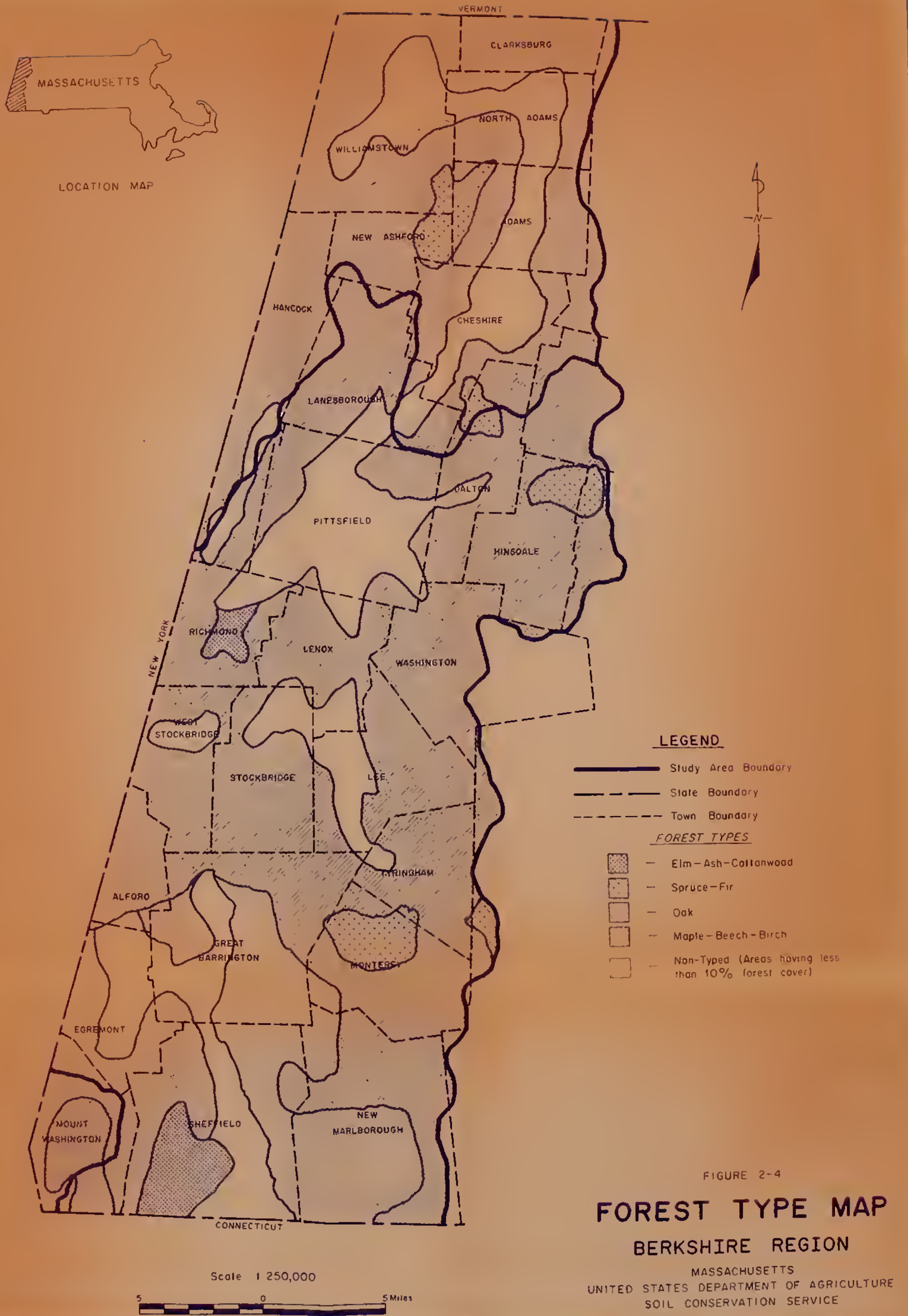
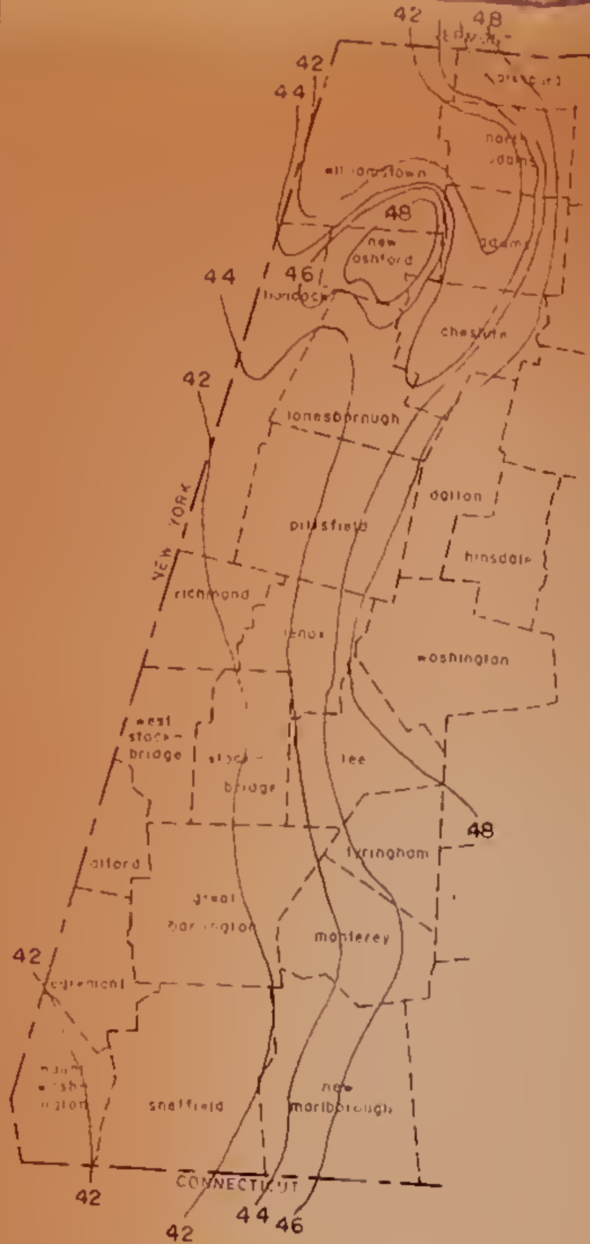


FIGURE 2-4

FOREST TYPE MAP

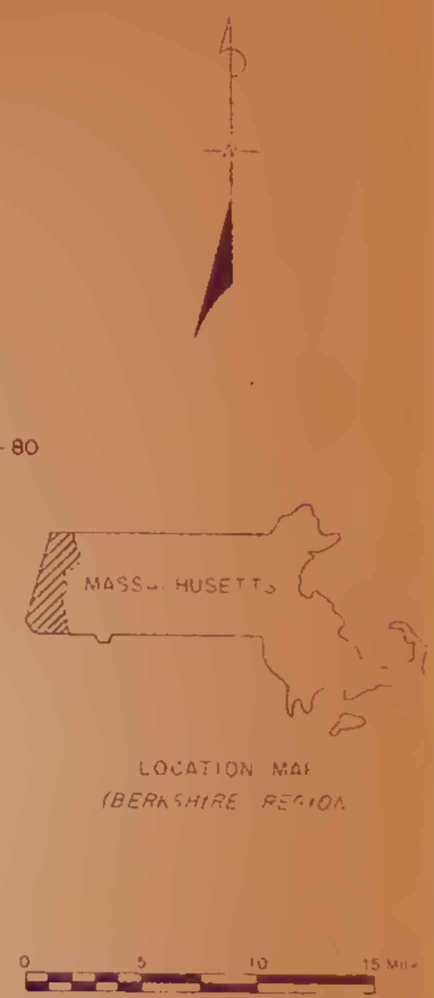
BERKSHIRE REGION

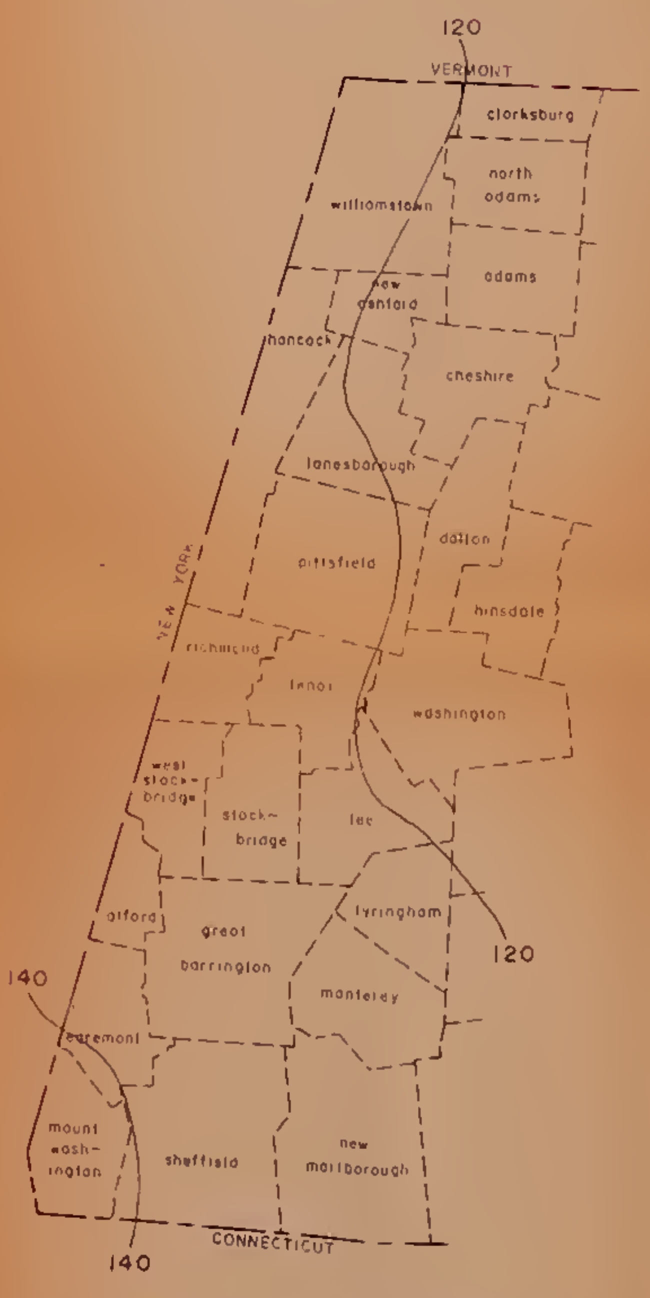
MASSACHUSETTS
UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE



AVERAGE ANNUAL PRECIPITATION - INCHES

AVERAGE ANNUAL SNOWFALL - INCHES





AVERAGE LENGTH OF GROWING SEASON - DAYS

AVERAGE RAINFALL - MAY THROUGH SEPTEMBER - INCHES

FIGURE 2-5

CLIMATOLOGICAL DATA

MASSACHUSETTS

UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

CAUTION SHOULD BE USED WHEN INTERPOLATING ON THIS MAP PARTICULARLY WITH VARIATIONS IN ELEVATION.

BASED ON DATA PUBLISHED BY THE ENVIRONMENTAL SCIENCES SERVICE ADMINISTRATION AND MASS STATE CLIMATOLOGIST.

2.2 Socio-Economic Data

General

The Berkshire Region is a noted recreation and tourist area with rugged terrain, good location and aesthetic attractiveness. It is well served by a network of highways and is within three hours of both New York City and Boston. The region is also served by two railroads, numerous trucking firms and three public airports (one in Pittsfield, another in North Adams, and a third in Great Barrington).

This section discusses present and projected levels of key socio-economic variables, and how each is related to the water and related land resources in the region.

Current and Projected Population 1/

In 1970, Berkshire County had a population of 149,402[2/] which was an increase of 7,009 since 1960, or a 4.9 percent gain over the ten-year period. Population density per square mile was 159 persons in 1970 as compared to a statewide density figure of 727 persons. In this same year, only 2.6 percent of the state's population resided in Berkshire County.

In discussing future population growth, it should be noted that there are two data sources to consider when discussing Berkshire County. One is the OBERS projections[3/] and the other is the Berkshire County Regional Planning Commission (hereafter referred to as BCRPC) projections.[4/]

1/Much of the discussion contained herein discusses Berkshire County and not the Berkshire Study Region per se. Considering the fact that the region comprises nearly 75 percent of the county, and that most of the economic activity takes place within the region, it is assumed that the relative changes estimated for the county are applicable to the region.

2/ 1970 Census of Population, General Social and Economic Characteristics, Massachusetts, page 588.

3/ The OBERS projections were developed by a joint effort of the Office of Business Economics (OBE -- presently named Bureau of Economic Analysis), U.S. Department of Commerce and the Economic Research Service (ERS), U.S. Department of Agriculture.

4/ Population projections were supplied to the Berkshire County Regional Planning Commission by the consulting firm of Curran Associates, Inc., Northampton, Massachusetts. The projections were published in the following: Berkshire County Regional Planning Commission, Stage I: Inventory and Future Needs, Water Supply and Sewerage: Berkshire County, Massachusetts, (Pittsfield, Mass., Berkshire County Regional Planning Commission, December 1969).

The OBERS is a National projection which is disaggregated to reflect state projections, standard metropolitan statistical area (SMSA) projections, and regional projections. One problem that occurs when disaggregating national projections to smaller areas is that the probability of error increases, and continues to increase as the disaggregation is perpetuated.

The BCRPC's projections were based upon past and present county data, and a stochastic simulation model was then applied to project population levels in the county, by town.1/ In comparing the OBERS Series E projections with those of the BCRPC's, a difference of 12,410 is found for the 1990 projections (167,590 vs 180,000).2/ Even though the OBERS is 7.4 percent higher than the BCRPC figure, the OBERS projection is within the confidence interval of the BCRPC projection (133,770 - 199,610).

In light of the fact that the OBERS Series E projections are within the confidence intervals of the BCRPC projections, both will be utilized in this study. Table 2-2, Historic and Projected Population Levels by Town, County and State show past and projected population figures for each town. County and state data are also given. As mentioned heretofore, there are some problems associated in using OBERS projections. Nevertheless such undertakings are helpful in determining what future levels may be. The intensions of the projections are clearly described by the Director of the Water Resources Council:

> The OBERS projections are intended as a planning tool, as a contribution to planning decisions. Wherever water and related land development problems may be solved by alternative levels of growth, through more or less resource development, full consideration should be given to such action, uninhibited by the projections contained in this report.

1/ Meier, Peter, Stochastic Population Dynamics for Regional Water Supply and Waste Management Decision Making, Technical Report No. EVE 25-70-5, University of Massachusetts, Amherst, Mass., August 1970.

2/ OBERS Projections are from 1972 OBERS Projections, Regional Economic Activity in the U.S., Series E: Population, Vol. 5, Standard Metropolitan Statistical Areas (Washington, D.C.: U.S. Water Resources Council, 1974), page 181. The BCRPC projections are from: Water Supply and Sewage: Berkshire County, Massachusetts, Stage I, page 314.

FIGURE 2-6

POPULATION DENSITY

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> The OBERS projections are not a goal. It is not intended that they be used as assigned shares or quotas. They are not intended as a constraint on any region's economic activity. They do not express what is desirable or undesirable.1/

In this light, then, the OBERS projections merely give an indication of what might be, given specified assumptions delineated in the OBERS Reports. They are as follows:

> The OBERS projections are based on longrun or secular trends and ignore the cyclical fluctuations which characterize the shortrun path of the economy. The general assumptions that underlie the projections are as follows:
>
> 1. Growth of population will be conditioned by a fertility rate which represents "replacement level fertility."
>
> 2. Nationally, reasonably full employment, represented by a 4 percent unemployment rate, will prevail at the points for which projections are made. As in the past, unemployment will be disproportionately distributed regionally, but the extent of disproportionality will diminish.
>
> 3. The projections are assumed to be free of the immediate and direct effects of wars.
>
> 4. Continued technological progress and capital accumulation will support a growth in private output per man hour of 2.9 percent annually.
>
> 5. The new products that will appear will be accommodated within the existing industrial classification system, and, therefore, no new industrial classifications are necessary.
>
> 6. Growth in output can be achieved without ecological disaster or serious deterioration, although diversion of resources for pollution control will cause changes in the industrial mix of output.
>
> The regional projections are based on the following additional assumptions:
>
> 1. Most factors that have influenced historical shifts in regional "export" industry location will continue into the future with varying degrees of intensity.
>
> 2. Trends toward economic area self-sufficiency in local-service industries will continue.
>
> 3. Workers will migrate to areas of economic opportunities and away from slow-growth or declining areas.

1/ 1972 ORERS, Series E, Vol. 1, p. iii.

4. Regional earnings per worker and income per capita will continue to converge toward the national average.

5. Regional employment/population ratios will tend to move toward the national ratio.

Regional assumptions 4. and 5. are corollaries of assumption 3.. They are in the nature of central tendencies only. In some circumstances they may be counterbalanced by other forces. The migration of retired people to attractive retirement areas without regard to economic opportunity there is an example of this counter-effect.1/

State and local planners and officials can compare their respective areas to determine what assumptions apply and adjust the OBERS projections accordingly.

1/ 1972 OBERS, Series E, Vol. 1, p. 6.

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Table 2.2: Historical and Projected Population Levels by town, county and state.

Town	Actual 1/		1970 Population Density 2/	Projected 3/	
	1960	1970		1990	2010
Housatonic Study Area:					
Alford	256	302	26	250	290
Dalton	6436	7505	340	8940	9700
Egremont	895	1138	60	1980	3310
Great Barrington	6624	7537	163	8180	9120
Hinsdale	1414	1588	73	1680	1870
Lanesborough	2933	2972	99	6120	9020
Lee	5271	6426	235	7480	8640
Lenox	4253	5804	265	6330	7410
Monterey	480	600	22	1060	1730
New Marlborough	1083	1031	21	1330	1570
Pittsfield	57,879	57,020	1354	56,230	56,780
Richmond	890	1461	76	1960	3000
Sheffield	2138	2374	48	3130	3870
Stockbridge	2161	2312	97	3020	3690
Tyringham	197	234	12	270	300
Washington	290	406	10	340	390
West Stockbridge	1244	1354	72	1680	2030
TOTAL	94,444	100,064	--	109,980	122,720
Hudson Study Area:					
Adams	12,391	11,772	512	12,960	13,330
Cheshire	2472	3006	109	4310	5870
Clarksburg	1741	1987	154	2620	3180
Hancock	455	675	19	750	1020
Mount Washington	34	52	2	50	50
New Ashford	165	183	14	330	590
North Adams	19,905	19,195	936	19,890	20,020
Williamstown	7322	8454	179	10,580	13,770
TOTAL	44,485	45,324	--	51,490	57,830
REGION TOTAL	138,929	145,388	--	161,470	180,550
Berkshire County	142,135	149,402	159	167,590	187,920
Massachusetts	5,148,578	5,689,170	727	6,875,500 4/	8,020,000 4/

1/ Source: U.S. Census of Population, 1960 and 1970.
2/ Population Density - people per square mile.
3/ Source: Berkshire County Regional Planning Commission.
4/ Source: 1972 OBERS Projections, Series E, Vol. 4, States.

Current and Projected Economic Activity

Although Berkshire County is primarily rural, it has kept pace with the remainder of the state and nation in terms of many measures of economic well-being. For example, in 1970, per capita income (in 1967 dollars) for the county was $3,650 as compared to the State's level of $3,822 and the Nation's level of $3,476.1/ Projections to 1990 suggest that the county will have a per capita income of $6,400, the state will have one of $6,700, the same relative position as in 1970.2/

Another variable that gives an indication of the relative economic position of the county to the state and national position is the employment/population ratio. In 1970, the County's was .40, the State's .41 and the Nation's .39.3/ Projections to 1990 show the County's ratio increasing to .44, the State's to .46 and the Nation's to .43.4/ Such comparisons of future relative positions should be made with caution, however, simply because the assumptions listed on page __ are rather restrictive. Thus, if the assumptions are found to be unrealistic, then the state and regional ratios may not be comparable to the national levels. This is due to the fact that on the national scale, when there is a drop in one economic sector of the country, there is usually a comparable or nearly comparable increase in another part, which usually balances out. From a regional perspective, however, especially a region as undiversified as the Berkshire Region, such compensating effects are minimal.

Total employment has also increased in the county. Thus, with an increase of both per capita income and total employment, total personal income has also risen. Projections suggest that such increases will continue. Between 1950 and 1970, total personal income increased nearly 85 percent.1/ Projections to 1990 suggest an increase of 13 percent from the year 1970.

1/ 1972 OBERS: SMSA, Vol. 5, p. 181; States, Vol. 4, p. 67 and U.S., Vol. 1, p. 38.
2/ Ibid.
3/ Ibid.
4/ Ibid.

On a state basis, the increase from 1950 to 1970 was 106 percent, and the projected increase from 1970 to 1990 is 113 percent. Such increases, in terms of resource demand, are significant. As income increases (assuming that inflation rates are such that there is an increase in real income) demand for a multitude of goods and services also increase, hence an increase demand on the resource base.

Total earnings from the various economic sectors have increased with the exception of the agricultural and forestry sectors. Projections for Berkshire County indicate that agricultural earnings will increase between 1970 and 1980, will stabilize, and then increase again commencing with the year 2000. All other major sectors showed increases between 1950 and 1970. In 1970, manufacturing accounted for $186,264,000 (1967 dollars) which represented 44 percent of the total earnings for the county. OBERS projections indicate that by 1990, manufacturing will represent 37 percent of the total earnings, with electrical machinery and supplies contributing over 36 percent to manufacturing earnings.1/ The electrical machinery and supplies category is by far the largest source of manufacturing earnings.

In summarizing the economic projections, increases in total earnings are expected, with all categories increasing over their 1970 levels by 1990. The agricultural and forestry sectors are expected to more than double their 1970 levels in 2020. It is noteworthy that the earnings of service-related industries are projected to increase 176 percent between 1970 and 1990.

Table 2-3 summarizes the historical and projected levels of population, employment, earnings and personal income for selected years, between 1950 and 2000, for Berkshire County and the Commonwealth of Massachusetts.

The projected socio-economic changes give rise to a myriad of potential implications in water and related land resource planning. The Berkshire

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1/ 1972 OBERS: SMSA, Vol. 5, p. 181.

Region, like most parts of the Northeast, does not have a problem with total water volume per se, but does have when usable water supply is considered. Thus, the primary implication has to do with water quality.

The Berkshire County Regional Planning Commission's report, Water Supply and Sewerage, forcefully discusses the present and future problems of water quality in the county. And the projections of increased population growth and economic activity strongly suggests that good water resource management is a prerequisite for the future well-being of the county and the region. Socio-economic indicators provide the basis for the relevant dimensions of such water resource planning.

Solutions to water management problems in the past have, for the most part, been undertaken on a community-by-community basis. Although the results in some instances have been acceptable, there are many other cases where excessive construction and operating costs have been incurred. As a result, inefficient systems have been put into effect because alternatives requiring intermunicipal cooperation were not advanced or considered.1/

Recent studies have shown that rising domestic water use can be correlated with rising per capita income.2/ If projected increases in per capita income materialize, an increased use of domestic water can be expected. But, that is not all. Per capita income increases will also result in an increased demand for goods and services, which means increased water demand by industrial users of water. As water use increases, so will water contamination, and increased water treatment plant capacity will be required. This trend could be slowed or reversed if industrial reuse of water becomes more widespread.

1/ Berkshire County Regional Planning Commission, Water Supply and Management, Stage I, p. 1.

2/ Mann, Patrick C., Water Service Prices: A Principal Component and Regression Analysis of Determinants (Morgantown, W. V.: Regional Research Institute, West Virginia University, July 1972).

Table 2.3 -- Population, Employment, Personal Income, and Earnings by Industry, Historical and Projected, Selected Years, 1950-2000

	1950	1970	1990	2000
Population, midyear	132,838	149,660	180,000	194,300
Per capita income (1967 $)	2,224	3,650	6,400	8,500
Per capita income relative (U.S. = 1.00)	1.08	1.05	1.05	1.05
Total employment	53,323	59,657	79,800	89,400
Employment/population ratio		.40	.44	.46
		x1000		
Total personal income	295,371	546,300	1,162,300	1,662,600
Total earnings	237,646	422,623	878,000	1,248,100
Agriculture, forestry	7,021	3,975	4,600	5,100
Agriculture			4,400	4,900
Forestry			200	200
Mining	479	571	(a)	(a)
Contract construction	10,655	23,620	42,400	56,700
Manufacturing (b)	127,774	186,264	324,200	431,900
Food and kindred products			900	1,000
Textile mill products			3,300	3,100
Apparel and other fabric products			2,900	3,500
Lumber products and furniture			2,700	3,500
Paper and allied products			47,900	63,800
Printing & Publishing			15,900	23,600
Chemicals and allied products			19,300	29,800
Petroleum refining			(a)	(a)
Primary metals			6,000	6,900
Fabricated metals and ordnance			56,500	70,900
Machinery excluding electrical			29,700	44,700
Electrical machinery and supplies			117,100	150,600
Other manufacturing			21,300	29,800
Trans., comm. and public utilities	13,619	16,161	31,000	42,600
Railroad transportation			(a)	(a)
Trucking and warehousing			7,100	9,900
Other transportation and Services			3,400	5,000
Communications			10,800	15,500
Utilities (elec.,gas,sanitary)			8,200	10,900
Wholesale and retail trade	32,714	52,750	115,100	165,900
Finance, insurance and real estate	6,598	14,873	37,100	55,100
Services	24,860	73,911	203,900	320,200
Lodging places and personal services			13,800	16,900
Business and repair services			17,300	29,600
Amusement and recreation services			4,100	5,600
Private households			3,900	4,400
Professional services			164,600	263,500
Government	13,927	50,498	118,600	169,100
Federal government	2,075	5,222	8,100	10,600
State and local government	10,961	43,522	108,600	156,100
Armed forces	890	1,733	1,900	2,400

a - too small to project
b - Categories of historical manufacturing levels have been deleted to avoid disclosing confidential information

Source: <u>1972 OBERS Projections, Economic Activity in the U.S., Vol. 5, Standard Metropolitan Statistical Areas, Series E</u> (Washington, D.C.: U. S. Water Resources Council, 1974) P.181.

The North Atlantic Regional Resources Study listed six manufacturing industries as the major industrial users of water, and the major contributors to water pollution in the Northeast:

1. food and kindred products
2. textile mill products
3. paper and allied products
4. chemicals and allied products
5. petroleum refining
6. primary metals.1/

"Paper and allied products" is the major industrial water user in the Berkshire Region. The projected increase in production of approximately two-and-a-half times by 1990 is significant since water use and pollution are both correlated with production. Improved technology may increase the efficiency of production, but such large increases in production may cause both water supply and pollution problems.

Forestry

Much of the region's prime forest areas were once cleared and used for agriculture. Since the 1800's many of the old fields have since reverted to forests. Timber cutting has been in response to the market demand for wood products. With the steady decline in agricultural land, the total area of forestland has increased and presently covers 70 percent of the region.

Today, forests not only furnish material goods as in colonial times, they add to the quality of the environment. This is an economic advantage to the region. Therefore, improvement of the forest serves to enhance the region's economy as well over time.

1/ North Atlantic Regional Water Resources Study, Coordinating Committee. North Atlantic Regional Water Resources Study, Appendix L. Water Quality and Pollution, prepared by the Environmental Protection Agency for the North Atlantic Regional Water Resources Study Coordinating Committee, May 1972.

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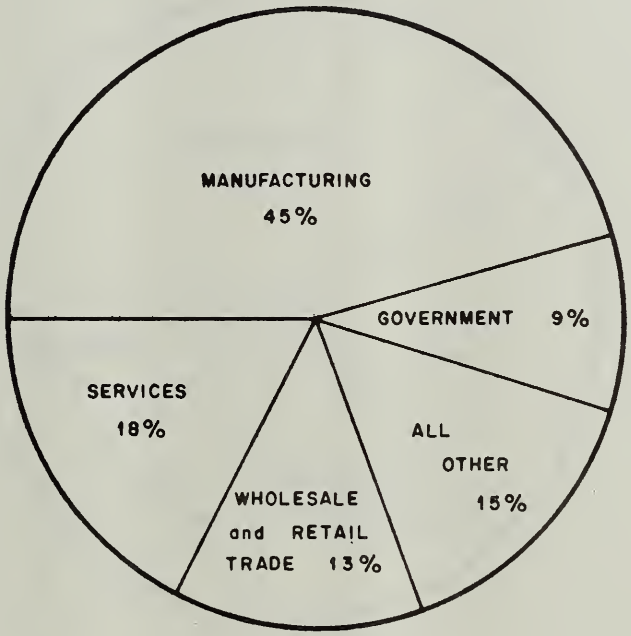
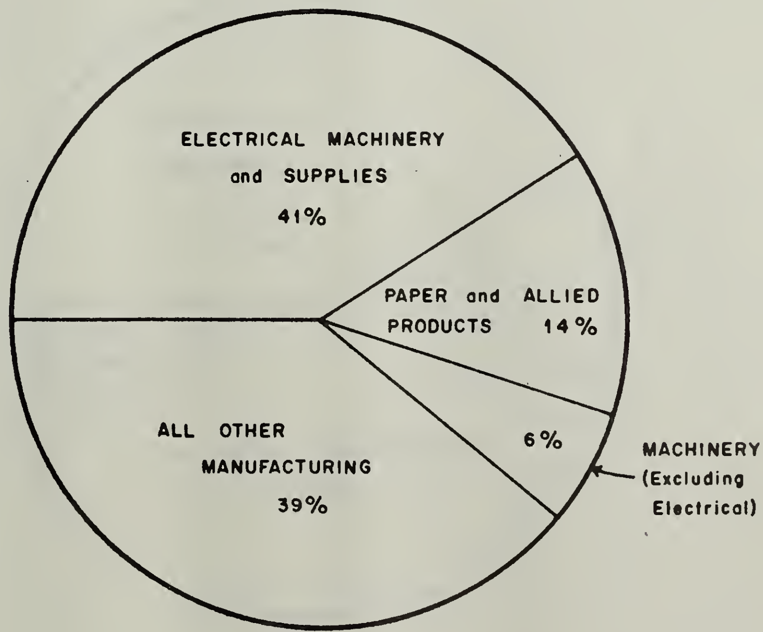
FIGURE 2-7

DISTRIBUTION OF EARNINGS FOR BERKSHIRE COUNTY IN 1970



MAJOR EMPLOYMENT CATEGORIES

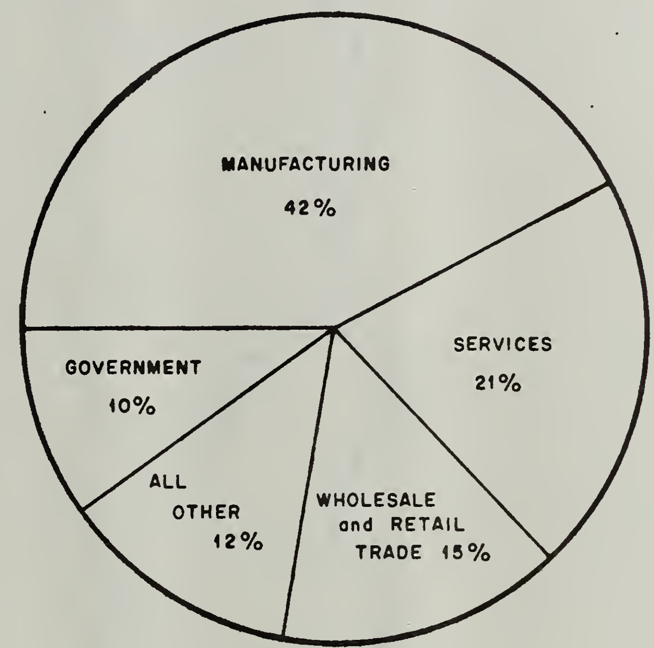


MANUFACTURING INDUSTRIES

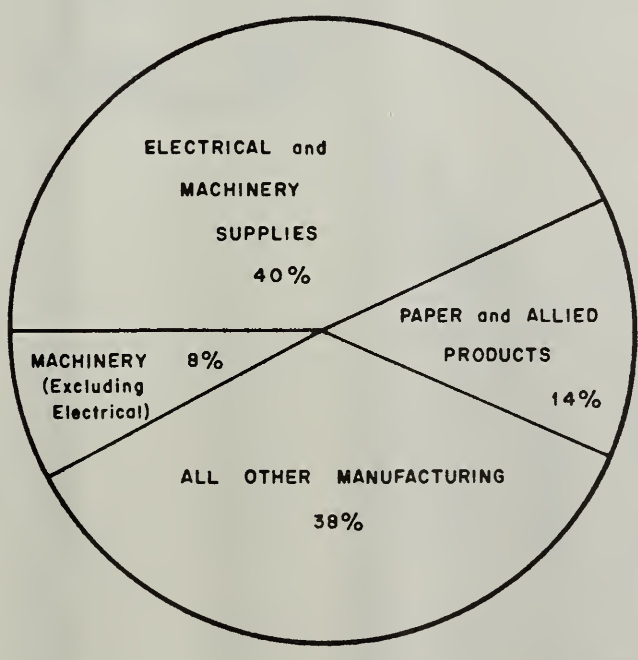
MASSACHUSETTS WATER RESOURCES STUDY
BERKSHIRE REGION

FIGURE 2-8

PROJECTED DISTRIBUTION OF EARNINGS FOR BERKSHIRE COUNTY IN 1990



MAJOR EMPLOYMENT CATEGORIES



MANUFACTURING INDUSTRIES

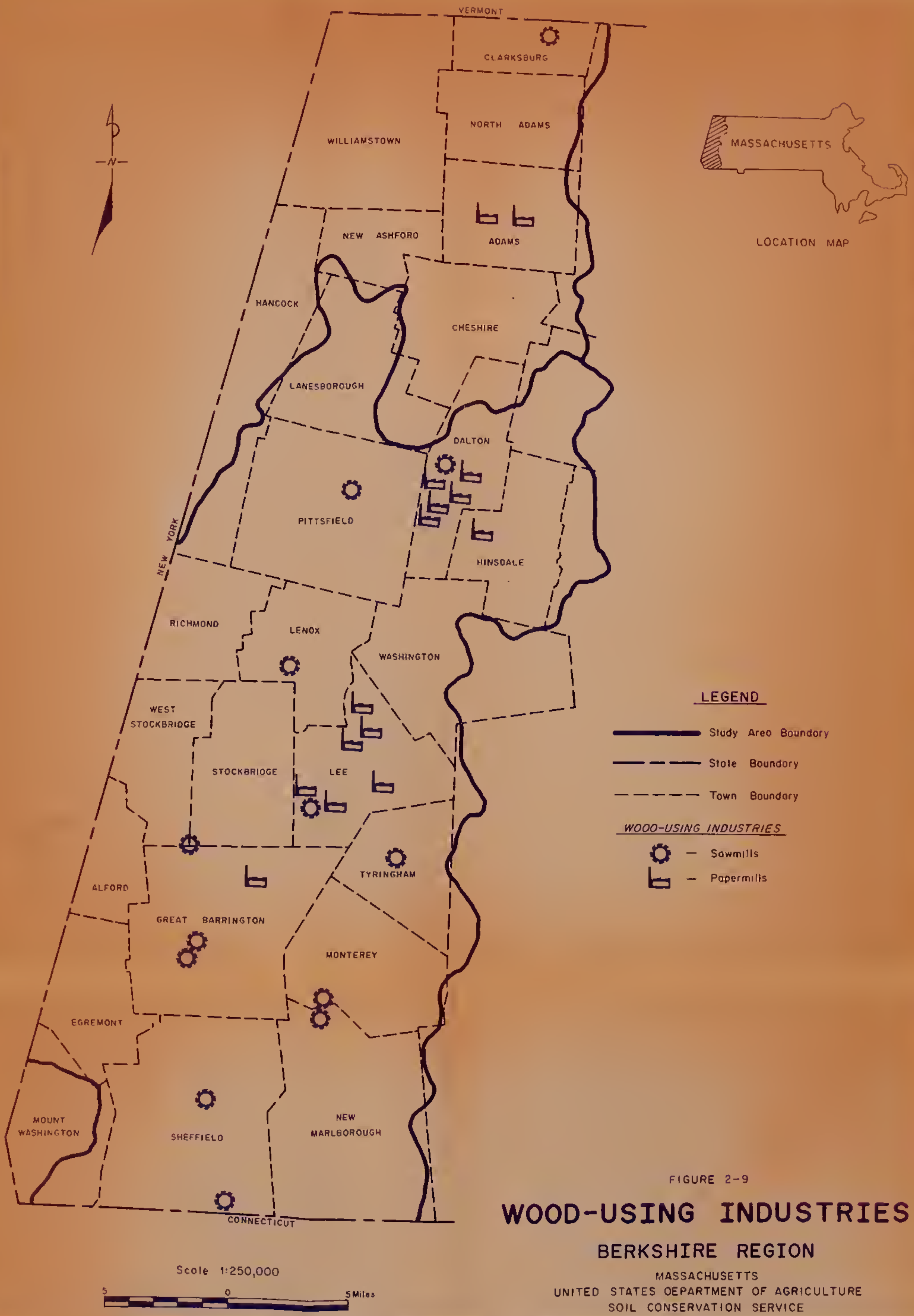


FIGURE 2-9

WOOD-USING INDUSTRIES

BERKSHIRE REGION

MASSACHUSETTS
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SOIL CONSERVATION SERVICE

Forestland can be more intensively utilized for both recreation and timber production. The production of wood products will continue to offer a long-term way to strengthen the rural economy.

National demands for timber are expected to remain strong and more than double by the year 2000. Presently, there is a regional demand for saw-logs, veneer logs, pulpwood, poles for log home construction, pallet stock, Christmas trees, mulch and firewood.

There is an opportunity for new wood-using industry. A pulpmill or a particleboard plant using roundwood or residue would better utilize the supply of small and poor quality logs and residues. A plywood mill and a pole treatment plant would also be great assets to the area. Increased development of the sugar maple industry would be compatible with the regional socio-economic setting and would contribute to the economy.

Additional data on timber production levels and land use alternatives may be found in Chapter 3, Land Use.

Agriculture

Although agriculture plays a minor role in the economic activity of the region, it is still significant to water and related land use and resource planning. A proper land use mix is closely associated with water resource management and with visual and environmental quality.

Agriculture is a declining industry in Massachusetts and Berkshire County is no exception. In Massachusetts as a whole, the average size farm has been increasing but in Berkshire County, the average size has been declining. (See Table 2-4). This trend suggests rather vividly that farm land in the region is being converted to other uses. As the table shows, however, Class I farms (or those with sales of over $40,000 annually) have increased. Such an increase indicates the stronger economic viability of these enterprises, whereas the small scale operations have become marginal (usually Class IV and below). It should be noted that the increase in Class I farms probably occurred through the consolidation of Class II and Class III farms.

Table 2. 4 -- Number of Farms, Land in Farms, Value and Land Use, and Number of Farms by Economic Class 1964 and 1969.

	Berkshire County 1964	Berkshire County 1969	Change from 1964 to 1969 Number	Change from 1964 to 1969 Percent	State 1964	State 1969	Percent of State total 1964	Percent of State total 1969
Farms (number)	483	380	-103	-21	8,019	5,703	6	7
Land in farms (acres)	106,295	80,730	-25,565	-24	901,785	700,578	12	12
Average size of farms (acres)	220	212	-8		112	123		
Total Cropland (acres)	41,734	34,227	-7,507	-18	347,835	280,455	12	12
Harvested cropland (acres)	27,391	22,481	-4,910	-18	234,445	189,635	12	12
Value of land and buildings (dollars)		26,585,919				395,572,756		6
Average per farm (dollars)	39,384	69,962			43,492	69,362		
Average per acre (dollars)	179	329			386	565		
Cropland used only for pasture and grazing (acres)	9,394	9,289	-105	-1	79,943	71,515	12	13
Class 1 0,000 and over	50	69	+19	+38	760	774	6	9
Class 2 $20,000 to 39,990	81	70	-11	-14	1,035	880	8	8
Class 3 $10,000 to 19,999	82	24	-58	-71	1,339	800	6	3
Class 4 $5,000 to 9,999	48	28	-20	-42	1,166	600	4	5
Class 5 $2,500 to 4,999	37	30	-7	-19	853	611	4	5
Class 6	33	26	-7	-21	496	329	7	8
Part time	98	95	-3	-3	1,484	1,241	7	8
Part retirement	54	37	-17	-31	845	432	6	8
Abnormal	--	1	+1	100	41	36	0	0

Class 6 - Class 6 farms have a value of farm products sold of $50 to $2,499 and a farm operator under 65 years of age who did not work off the farm 100 days or more in the census year.
Part time - A farm with sales of $50 to $2,499 of farm products and a farm operator who is under 65 years of age and worked off the farm 100 days or more in the census year.
Part retirement - A farm with sales of $50 to $2,499 of farm products and a farm operator 65 years or over.
Abnormal - Includes institutional farms, experimental and research farms and Indian reservations. Institutional farms include those operated by hospitals, penitentiaries, schools, grazing associations, government agencies, etc.

Source: U. S. Census of Agriculture, 1964 and 1969.

The value of all farm products sold in the county is six percent of the state total. Table 2-5 shows the value received for livestock (including dairy) and poultry represents approximately 90 percent of the total value of farm products. Crops contributed a relatively insignificant amount.

Dairying is by far the most important agricultural enterprise in the county and in the region. Such pursuits contribute over 75 percent of the farm income and sales generated in the county.

TABLE 2-5 - VALUE OF FARM PRODUCTS SOLD, BY PRODUCT, 1969.1/

	Berkshire County 1969	State total 1969	Percent of State total
	Dollars	Dollars	Percent
All farm products sold Value	8,319,532	138,649,782	6.0
Average per farm	21,893	24,312	
Crops	823,396	61,859,426	1.3
Livestock and poultry and their products	7,400,646	76,359,731	9.7

Although crop production provides a meager proportion of agricultural output, it is interesting to note the trend of corn production, especially that grown for silage. Although, a discussion of agricultural management trends is treated in some detail in Chapter 3, a cursory discussion entailing dairying will be presented here. In the past, most dairy herds were pastured and their forage intake was supplemented with grain and silage. Today, however, many farmers "bring the forage to the cows" in the form of green cut crops, primarily corn. This trend is obviously reflected in the data on Table 2-6 which shows that corn silage production increased by 112 percent since 1964 while corn grown for grain only increased 26 percent.

1/ Census of Agriculture, 1969, pp. 17 and 21.

Table 2.6 -- Field Corn: number of farms, acreage and production, 1964-1969

	Berkshire County		Change from 1964-1969		State Total		Percent of State Total	
	1964	1969	Number	Percent	1964	1969	1964	1969
Harvested for grain								
Farms reporting	13	11	-2		113	98		
Acres	181	146	-35	-19	1,279	1,834	14	7.9
Production (bu)	10,996	13,889	2,893	26	87,924	158,327	12.5	8.7
Harvested for silage								
Farms reporting	113	90	23		1,163	869		
Acres	2,543	3,441	898	35.3	22,036	263,871	11.5	13.2
Production (tons)	29,946	63,537	33,591	112	25,906	459,373	11.3	13.8
: for fodder								
Farms reporting	NA	10			NA	46		
Acres	43	65	22	51.1	589	367	7.3	17.7

NA - Not available

Source: U.S. Census of Agriculture, 1964 and 1969.

CHAPTER 3 - LAND USE

3.1 SUMMARY

Land use in the Berkshire Region is dominated by forest and agriculture. Approximately 82 percent of the land area, or 362,270 acres, is in the above two land use categories. Seven percent of the land is in urban uses. Wetlands, water and "other" land uses contribute to the balance.

During the 20-year period between 1952 and 1972, significant changes in land use have occurred. Agricultural land decreased by almost 26 percent (20,817 acres) while urban land increased by over 100 percent (15,099 acres). Forestland, water, and "other" land use categories remained relatively stable.

Past census data (1949, 1954, 1959, 1964 and 1969) were utilized to project trends in agricultural land. These projections suggest that agricultural land will decrease by 13 percent (10,500 acres) between 1969 and 1985 and by 20 percent (16,200 acres) by 1990. To the extent that all projections are based upon past data and the land use trends so identified, projections in this report should be considered "without plan" conditions. A more detailed discussion of this is found in Section 3.4.

In the "Problems and Objectives" section, each land use category is discussed and potential problems are delineated. Alternatives are suggested which, if implemented, might stem the tide of decreasing agricultural land use. Forestland in the region is a vast resource which is being underutilized, and suggestions are tendered which may help to alleviate this problem. The increase in "other" land results primarily from agricultural land leaving production, hence if agricultural land can be maintained, the increase in "other" land will be minimized. There are at least four regional agencies involved in urban planning, therefore, problems and objectives in urban land use were not covered in this report. Specific discussions on this topic would be a duplication of ongoing efforts.

3.2 Resource Base and Existing Programs

Resource Base

The predominant land use in the Berkshire Region is forestland which covers nearly 70 percent (301,505 acres) of the region. Agricultural land comprises nearly 14 percent (34,374 acres of cropland and 26,391 acres of pastureland) of the region. As might be expected, those towns with a relatively large proportion of river flood plains have the largest amount of agricultural land.

State ownership of forestland amounts to 20 percent (60,700 acres) and municipalities own five percent (16,210 acres) of the total. See Figure 3-3 for ownership patterns and Figure 10-1 for locations of public holdings.

The Massachusetts Division of Forests and Parks is applying multiple use management to approximately 59,000 acres of forestland under its jurisdiction. Approximately 2,700 acres of public lands have been developed for general recreational use. Private recreational facilities exist on an additional 8,300 acres.

Forested areas totaling 2,500 acres are being managed primarily for wildlife by the Massachusetts Division of Fisheries and Wildlife and by private concerns such as game preserves and hunting clubs. About 13,000 acres of municipal watershed lands are designated for surface water production. (Figure 3-3)

Williams College now owns and operates the Hopkins Experimental Forest, a 1,600-acre tract located in the town of Williamstown.

Slightly over 50 percent of the total forest area is under some form of resource management.

There are nearly 30,000 acres of urban (residential, commercial-industrial and institutional) land in the Berkshire Region. The city of Pittsfield contains 24 percent of the urban land in the region. As can be seen in Table 3-1, residential land comprises the largest share of the urban land use category. Urban land uses, like agricultural uses, are concentrated in the river valleys. The juxtaposition of these two land uses may give rise to future problems.

Slightly more than four percent of the region is composed of wetlands (11,569 acres) and water surfaces (7,523 acres). These figures differ somewhat from those presented in Chapter 6, "Wetlands." The wetland acreage in Chapter 6 includes wooded swamps, but in this chapter they are included under the forestland category.

The final category concerns the "other" land use which is an aggregation of the following types: (1) abandoned fields which are reverting to forestland; (2) abandoned fruit orchards; (3) gas, telephone, oil or powerline rights-of-way 100 feet or more in width maintained through wooded areas; (4) mining or waste disposal areas; (5) open or undeveloped land which is in the midst of, or adjacent to, urban areas; and (6) recreational lands. The "other" land use category has many implications. Of the 28,062-acres in this category, 20,151, or nearly 72 percent, are abandoned fields or orchards. Historically, much of this abandoned land has either reverted to forestland or has been converted to urban land. Table 3-1 summarizes the various land uses for each town and/or city in the region and Table 3-2 lists the current land uses as a percentage of the total land in each municipality.

Table 3.1 -- Current land use by acreage for the Berkshire Region, 1972

Study area and town	Land use acreages by category									
	Cropland[1/]	Pasture	Wetland	Water	Forest	Industrial Commercial	Resi-dential	Institu-tional	Other	Total
Housatonic Study Area	25,520	17,359	10,759	6,617	206,821	3,269	16,968	1,978	19,780	309,071
Alford	890	721	32	--	5,107	--	305	3	374	7,432
Dalton	544	522	106	41	10,621	195	982	89	934	14,034
Egremont	2,088	850	223	97	6,663	15	918	19	1,247	12,120
Great Barrington	2,368	1,460	684	443	19,623	371	1,751	270	2,118	29,088
Hinsdale	633	313	492	503	10,232	12	570	123	952	13,830
Lanesborough	1,849	1,900	388	453	12,357	51	610	72	1,292	18,972
Lee	1,534	878	641	542	10,801	452	1,104	94	1,330	17,376
Lenox	1,003	456	803	204	8,656	433	1,139	94	1,154	13,942
Monterey	627	379	661	605	14,824	11	466	104	387	18,064
New Marlborough	2,569	1,503	1,226	528	22,918	11	507	159	839	30,260
Pittsfield	1,660	2,174	1,196	1,168	9,591	1,214	5,337	617	4,211	27,168
Richmond	2,043	888	564	200	7,179	--	615	--	721	12,210
Sheffield	4,653	2,610	993	727	19,785	118	928	91	1,512	31,417
Stockbridge	1,238	631	810	624	9,212	233	1,045	210	977	14,980
Tyringham	690	539	701	117	9,136	--	150	8	315	11,656
Washington	199	198	664	310	22,317	0	202	7	754	24,651
W. Stockbridge	932	1,337	575	55	7,799	153	339	18	663	11,871
Hudson Study Area	8,854	9,032	810	906	94,684	892	6,182	676	8,282	130,318
Adams	1,221	2,149	15	38	8,298	226	1,057	103	1,413	14,520
Cheshire	1,950	2,192	235	424	11,047	44	528	49	1,389	17,858
Clarksburg	268	218	110	49	6,345	14	619	10	527	8,160
Hancock	891	906	253	29	18,814	11	190	22	1,630	22,746
Mount Washington	206	168	29	94	13,658	--	104	18	47	14,324
New Ashford	252	285	40	--	7,583	8	29	--	395	8,592
North Adams	667	377	50	171	9,044	457	1,755	198	1,383	14,102
Williamstown	3,399	2,737	78	101	19,895	132	1,900	276	1,498	30,016
Total	34,374	26,391	11,569	7,523	301,505	4,161	23,150	2,654	28,062	439,389

1/ Cropland includes the following categories: Tilled land, untilled but tillable, orchards and nurseries.

Source: William P. MacConnell and William Niedzwiedz, Remote Sensing 20 Years of Change in Berkshire County, Massachusetts Agricultural Experiment Station, University of Massachusetts at Amherst, 1975.

Table 3.2--Current land use by percentage of total community area, 1972[1/]

Study Area and Town	Land Use by Category								
	Crop-land	Pasture	Wet-land	Water	Forest	Industrial Commer-cial	Resi-dential	Insti-tution-al	Other	Total[b]
Housatonic Study Area	8.3	5.6	3.5	2.1	66.9	1.1	5.5	.6	6.4	100.0
Alford	12.0	9.7	.4	--	68.7	--	4.1	a	5.0	99.9
Dalton	3.9	3.7	.8	.3	75.7	1.4	7.0	.6	6.7	100.1
Egremont	17.2	7.0	1.8	.8	55.0	.1	7.6	.2	10.3	100.0
Great Barrington	8.1	5.0	2.4	1.5	67.5	1.3	6.0	.9	7.3	100.0
Hinsdale	4.6	2.3	3.6	3.6	74.0	a	4.1	.9	6.9	100.0
Lanesborough	9.7	10.0	2.0	2.4	65.1	.3	3.2	.4	6.8	99.9
Lee	8.8	5.1	3.7	3.1	62.2	2.6	6.4	.5	7.7	100.1
Lenox	7.2	3.3	5.8	1.5	62.0	3.1	8.2	.7	8.2	100.0
Monterey	3.5	2.1	3.7	3.4	82.1	a	2.6	.6	2.1	100.1
New Marlborough	8.5	5.0	4.1	1.7	75.7	a	1.7	.5	2.8	100.0
Pittsfield	6.1	8.0	4.4	4.3	35.3	4.5	19.6	2.3	15.5	100.0
Richmond	16.7	7.3	4.6	1.6	58.8	--	5.0	--	5.9	99.1
Sheffield	14.8	8.3	3.2	2.3	63.0	.4	3.0	.3	4.8	100.1
Stockbridge	8.3	4.2	5.4	4.2	61.5	1.6	7.0	1.4	6.5	100.1
Tyringham	5.9	4.6	6.0	1.0	78.4	--	1.3	a	2.7	99.9
Washington	0.8	.8	2.7	1.3	90.5	--	.8	a	3.1	100.0
W. Stockbridge	7.9	11.3	4.8	.5	65.7	1.3	2.9	.1	5.6	101.0
Hudson Study Area	6.8	6.9	.6	.7	72.7	.7	4.7	.5	6.4	100.0
Adams	8.4	14.8	.1	.3	57.1	1.6	7.3	.7	9.7	100.0
Chesire	10.9	12.3	1.3	2.4	61.9	.2	3.0	.3	7.8	100.1
Clarksburg	3.3	2.7	1.3	.6	77.8	.2	7.6	.1	6.5	100.1
Hancock	3.9	4.0	1.1	.1	82.7	a	.8	a	7.2	99.8
Mount Washington	1.4	1.2	.2	.7	95.4	--	.7	.1	0.3	100.0
New Ashford	2.9	3.3	.5	--	88.3	a	.3	--	4.6	99.9
N. Adams	4.7	2.7	.4	1.2	64.1	3.2	12.4	1.4	9.8	100.0
Williamstown	11.3	9.1	.3	.3	66.3	.4	6.3	.9	5.0	99.9
Total[b]	7.8	6.0	2.6	1.7	68.6	1.0	5.3	.6	6.4	100.0

a) Less than .1 percent
b) Totals may not equal unity because of rounding errors.

Source: Based on information provided by William P. MacConnell, Remote Sensing 20 Years of Change in Berkshire County, Massachusetts Agricultural Experiment Station, University of Massachusetts at Amherst, 1975.

Existing Programs

In recent years, the Massachusetts General Court (legislature) has enacted a number of land use laws and land use enabling laws. A brief synopsis of the more significant ones, as well as other land use programs, follow.

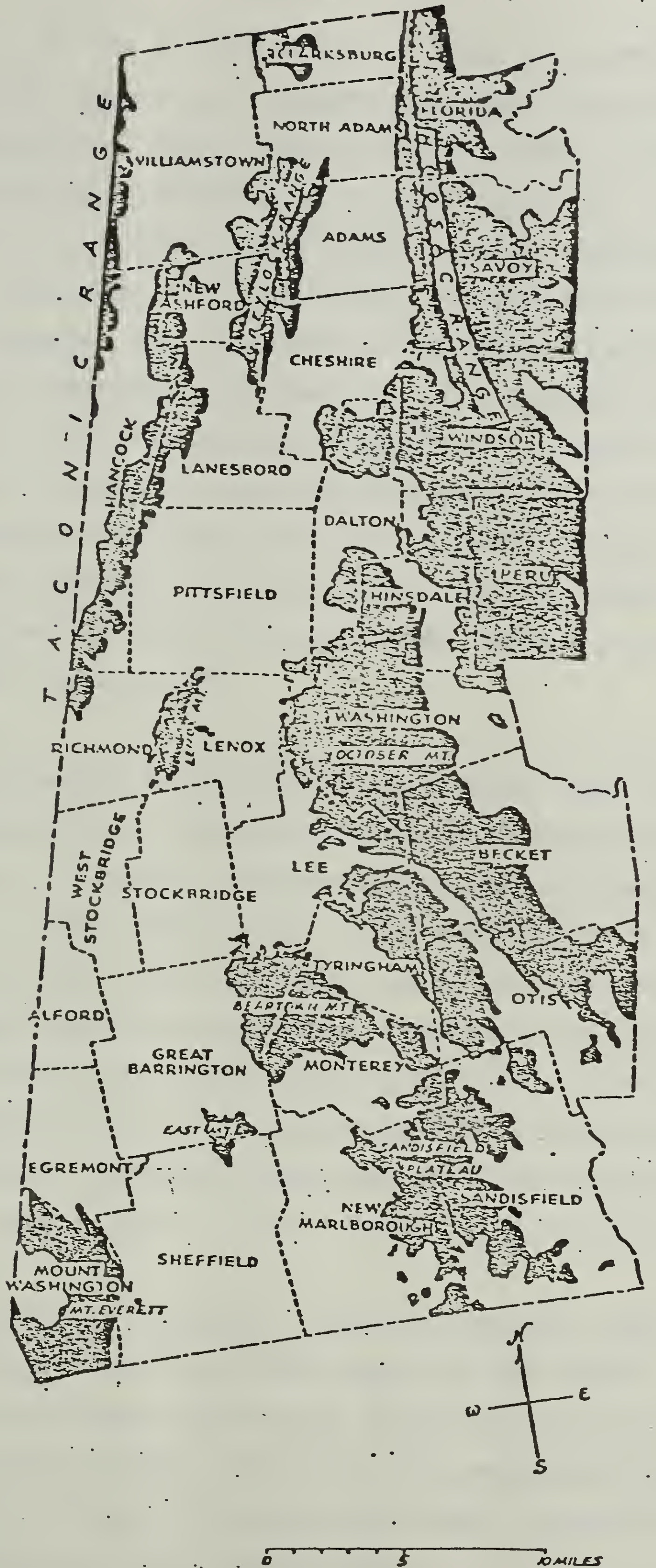
Six of the more significant laws deal with (1) the regulating of activities in mountain regions of Berkshire County,1/ (2) the provision of assessment of agricultural or horticultural land at a value based upon its agricultural or horticultural use,2/ (3) the acquisition of conservation restrictions,3/ (4) inland wetlands and flood plains,4/ (5) the limitation of liability to landowners who permit the public use of their land for recreational purposes,5/ and (6) the forestland tax law.6/ In addition, potential impact of the National Flood Insurance Program will be discussed.

The mountainland act is interesting in that it allows any town or city of Berkshire County to set boundaries of mountain regions (given some elevation restrictions), and then to regulate any activities that deal with removing, filling, excavating or altering any land within that region. The purposes of the law are to prevent pollution and erosion, and to preserve the natural scenic qualities inherent in such areas. Figure 3-1 depicts the proposed scenic mountainland areas.

The agricultural and horticultural reassessment bill is designed to provide property owners economic incentives (in the form of lower property taxes) to maintain productive agricultural or horitcultural pursuits, and thus preserve open space. Massachusetts is one of 32 states that provide for such assessments.7/

1/ Chapter 131, Section 39A, General Laws, August 1974.
2/ Chapter 61A, Section 1, 2 & 24, General Laws.
3/ Chapter 184, Section 23-33, General Laws.
4/ Chapter 131, Section 40A, General Laws.
5/ Chapter 27, Section 17C, General Laws.
6/ Chapter 61, Section 1-7, General Laws.
7/ Engel, N. Eugene, "Political and Economic Forces Behind State and Local Approaches to Retain Prime Land," perspectives on Prime Land, USDA, 1975, p. 218.

FIGURE 3.1--Proposed Scenic Mountain Land Areas, Berkshire County, MA.



Source: Warren E. Archey, "Landmark Legislation--The Scenic Mountains Act," Community Resource Development, Vol. XI, No. 4 (Dec., 1974), Cooperative Extension Service, University of Massachusetts, U.S. Department of Agriculture and County Extension Services cooperating (Amherst, 1974).

Recent research as to the effectiveness of these assessments has indicated that in some locations such tax programs may have little impact on the preservation of agricultural land. As Berry points out, a strong demand for residential land, such as that found in urban counties, "will overwhelm any effect a reduction in property taxes would have on reducing the loss of farmland."1/ Berry also notes that the demand for conversion of farmland is derived from the demands for increased urbanization, second homes, and other more local demands depending upon the area (e.g., demand for expansion of strip mining)."2/ Since the Berkshire Region is primarily rural, the impact of the agricultural assessment law may be greater than in urbanized areas, but it is considered to be questionable as a means to stem the conversion of farmland. This reasoning is supported by the fact that the penalties for selling farmland for other purposes under the act are not severe enough to discourage such transactions.

In 1969, the Commonwealth of Massachusetts enacted legislation for the purpose of protecting conservation and preservation restrictions held by appropriate public authority.3/ In 1972, legislation was also adopted which provided for the reassessment of real estate under such restrictions to reflect the lower value of such land after the development value was removed.4/ The future impact of the various laws restricting land use (includes the Inland Wetland Restriction Act, the Conservation Restriction Act and the Scenic Rivers Act) are difficult to estimate. The time period since the enactment of these laws has been too short to assess the impacts. However, given the political and popular climates, it would be safe to assume that "critical areas" will, in most cases, be preserved.

The next act discussed is one which limits the damage liability of landowners who allow recreational uses on private lands by the public. The obvious purpose of this act is to eliminate the present liability of private landowners which serves as a deterrent to their providing more recreational opportunities to the public. Again the time period has been too short to permit an intensive examination of the effects of this legislation.

1/ Berry, David, The Effect of Property Taxes on the Loss of Farmland (Philadelphia: Regional Science Research Institute, 1975). p. 5.

2/ Ibid. p. 3.

3/ Ellis, Robert J. and Alexander D. Dawson, J.D., Massachusetts Conservation Commission Handbook, 1973, Edition (Boston, Massachusetts Association of Conservation Commissions, 1973). p. 55.

4/ Ibid. p. 33.

The final act discussed is the Classification and Taxation of Forest Lands (General Laws, Chapter 61) as amended. Landowners who have at least 10 contiguous acres of forestland having a value not over $400 an acre (land and timber) may apply to their local tax assessors to have their forestland classified under the law. If the state forester determines that the woodland owner qualifies, the land and timber are taxed separately. The land is assessed at not more than $10 per acre and annual taxes are paid on this basis. Also, a forest products tax of eight percent is paid on the value of forest products harvested. A rollback applies if the land is withdrawn from the forest classification. In addition to the tax incentive program for private landowners there is a forest management program for public forest holdings.

The National Flood Insurance Program, administered by the United States Department of Housing and Urban Development (HUD), may have a substantial impact on guiding land use.1/ One criteria for being included in this program requires that towns (or cities) implement flood plain management. It is clearly in the interest of those towns which have flooding problems to join the program for through such membership, affordable flood insurance can be purchased by individual property owners. Chapter 4 - Flooding - has detailed information on the National Insurance Program. It should be noted that nearly all the towns in the region have joined this program. Assuming that no major changes to the program are enacted, it appears that development in the various flood plains will, at least, be curtailed.

3.3 Past Land Use and Land Use Changes: 1952-1972

Like many other parts of the Northeast, the Berkshire Region has experienced significant changes in some land use categories. An examination of these changes is a necessary prerequisite in the development of predictors of future patterns of change. Such predictors can provide a foundation for resource planners and formulators of public policies and programs in determining impacts of future land use.

1/ The National Flood Insurance Program was established by the United States Congress through the National Flood Insurance Act of 1968, and was expanded in the Flood Disaster Protection Act of 1973.

William P. MacConnell and others have compiled a great deal of land use information in Massachusetts by towns for the years 1952 and 1972.1/ Some caution must be employed in interpreting land use changes reflected in this work since mapping and interpretation techniques were slightly different for each time period. For example, the "Water" category in the 1952 study, because of mapping scale, included ponds, lakes and only the larger impoundments along the Housatonic and Hoosic Rivers. Narrower flowing sections of these rivers were not included in the water category. These water areas were interpreted as that land use adjacent to the rivers. The 1972 study included these flowing sections as water. Thus, when one tries to compare the acreage in the various categories for both periods, some interpretation may be necessary.1/

Urban and agricultural land use categories changed the most between 1952 and 1972. Agricultural land decreased by almost 26 percent from 81,582 acres in 1952 to 60,765 acres in 1972. Urbanization, on the other hand, increased by over 100 percent, going from 14,866 acres to 29,965.

A cursory glance at the land use data indicates that, since agricultural land was the only category that decreased, urbanization must have occurred on agricultural land. However, this conclusion is not necessarily valid. A common occurrence is that agricultural land is often abandoned and allowed to revert to forestland. Over the 20-year period being examined, forestland increased by 4,413 acres (or 1.5 percent), most of this coming from the "other" land use category that was formerly in agricultural land.

Much urbanization has occurred on agricultural land, especially on those lands on river valley bottoms which are adjacent to urban areas. The urbanization (primarily residential growth) in the northern towns of the region has occurred primarily on forestlands which are adjacent to skiing and other outdoor recreational areas.

1/ MacConnell, William P. et al.

In analyzing the changes that have occurred on the wetlands and water categories, circumspection must be employed. Water acreage increases were due to the installation of new impoundments and to a difference in mapping techniques.

The wetland category also poses some problems when comparisions are made over time. In 1952, beaver ponds, seasonally flooded flats and bogs were not included as wetland types but these were included in the 1972 study. Wooded swamps are not included in either study year, thus, the wetland category can be considered open wetlands. Overall, wetlands increased in the region by 14.2 percent, or 1,439 acres more than the 1952 acreage of 10,130. These increases were due primarily to an increase in the beaver population and the associated increase in beaver ponds.

Forestland acreage has remained relatively stable over the period, increasing by 4,413 acres (or 1.5 percent). Although some forested areas were lost to development, additional land entered this category from the natural succession of former agricultural land, or "other" lands.

Urban land increased by over 100 percent. This category of land use is divided into three subcategories: (1) industrial-commercial, (2) residential, (3) institutional. All three have increased rapidly. Industrial-commercial grew by 125.2 percent, residential increased 88.9 percent and institutional increased by 249.2 percent.

Land in the "other" land use category remained relatively constant. Apparently this consistency was maintained by having former agricultural lands entering this category in amounts slightly less than those which left. The "other" land use category is significant in that the majority of these land uses are open but are at the same time transitional. In such a state, this category has great value as wildlife habitat and as a provider of aesthetic variation in land uses. Table 3-3 summarizes the land use changes between 1952 and 1972.

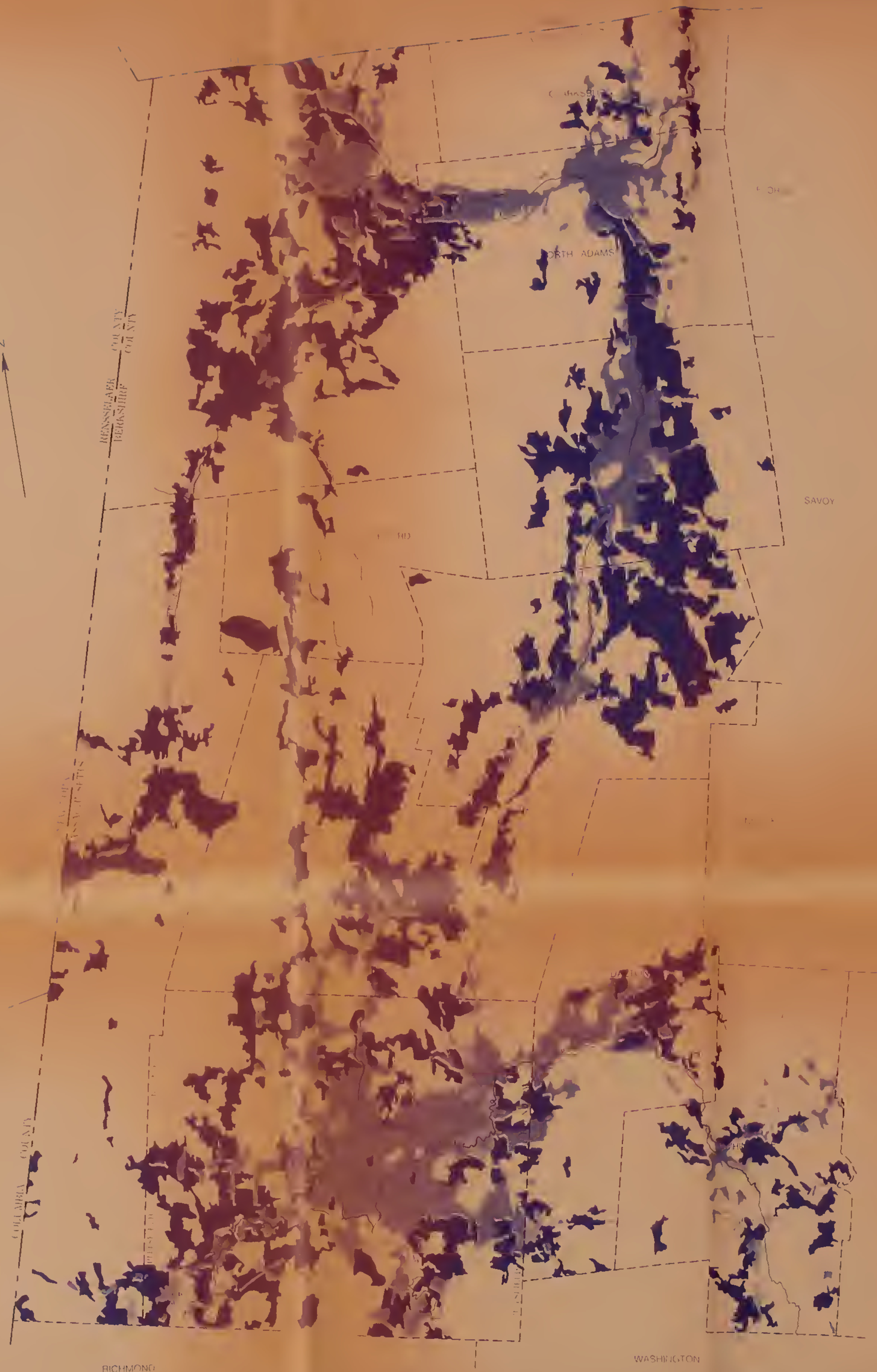


FIGURE 3.2 (Sheet 1)
GENERAL LAND USE MAP
THE BERKSHIRE REGION

TABLE 3-3 - Changes in Land Use, Berkshire Region, 1952-1972 1/

Land Use	1972	1952	Acres	%
Agriculture	60,765	81,582	-20,817	- 25.5
Cropland	34,374	36,100	- 1,726	- 4.8
Pasture	26,391	45,482	-19,091	- 42.0
Wetland	11,569	10,130	1,439	14.2
Water	7,523	5,410	2,113	39.1
Forest	301,505	297,092	4,413	1.5
Urban	29,965	14,866	15,099	101.6
Industrial/Commercial	4,161	1,848	2,313	125.2
Residential	23,150	12,258	10,892	88.9
Institutional	2,654	760	1,894	249.2
Other	28,062	30,309	- 2,247	- 7.4
Total	439,389	439,389		

1/ Based on information provided by William P. MacConnell and William Niedwiedz, Remote Sensing 20 Years of Change in Berkshire County, Massachusetts 1952 - 1972 Agricultural Experimental Station, University of Massachusetts, at Amherst, November 1975.

3.4 Land Use Projections

Land use projections in the Berkshire Region were formulated using historical land use data. For this reason, impacts of recent land use legislation on future land use patterns is not quantifiably attempted. Therefore, the Berkshire Region land use projections should be considered "without plan" projections.

Data requirements for agricultural land projections preclude the use of MacConnell's data (which was collected for only two points in time). As a consequence, agricultural census data for 1949, 1954, 1959, 1964 and 1969 were used. The difference in the two data sources prevents direct comparison. However, the projected percentage changes in agricultural land computed using the census data were applied to MacConnell's 1972 land use data to derive agricultural land projections.

Projections of water areas were assumed to be the 1972 figure with an additional 320 acres which will be created by the completion of the PL-566 projects on Washington Mountain Brook. Wetland acres were projected to amount to 11,160 acres representing a .2 percent decline per year.

Urban land was projected by assuming that urban acreage per capita would parallel past trends. 1990 population projections were taken from Water Supply and Sewerage, Berkshire County, Massachusetts1/ and urban acreage per capita were derived. It should be noted, however, that the urban projection is considered to be conservative (see MacConnell, p. 41).

"Other" land was projected by first assuming that the abandoned fields and orchards in 1972 (amounting to over 20,000 acres) would revert to woodland or to other uses. The remaining categories that comprise the "other" land uses (recreation, urban open, mining and waste disposal) were increased to reflect past trends.

The final category, forestland, was projected as the residual of all other uses.

Table 3-4 summarizes the land use projections.

TABLE 3-4 - BERKSHIRE REGION LAND USE PROJECTIONS

Category	1972 Acres	1990 Acres	Percent Change
Agricultural Land	60,765	48,612	-20.0
Wetland	11,569	11,160	- 3.5
Water	7,523	7,843	+ 4.2
Forest	301,505	313,424	+ 4.0
Urban	29,965	48,400	+61.5
Other	28,062	9,950	-64.5

1/ Curran Associates, Inc. Water Supply and Sewerage, Berkshire County, Massachusetts, Volume I, 1969. pp. 39-313.

Data source differences prevent a direct means whereby agricultural land can be subcategorized into cropland and pastureland. Historically, however, although agricultural land decreased as a proportion of the total land in the region, the proportion each subcategory contributed to total agricultural land remained relatively constant. If it is assumed that these proportions will continue in relatively the same magnitude, then a loss of approximately 6,000 acres of cropland and/or tillable pasture can be expected by 1990, with subsequent decreases in agricultural production and income.

3.5 Problems and Objectives

Agricultural Land

The shift of agricultural land to nonagricultural uses is a major land use problem in the Berkshire Region. The declining amount of harvested cropland provides a good illustration.1/ In 1949, there were 47,529 acres of cropland harvested, yet only 22,481 acres in 1969, a decline of 25,045 acres or 53 percent.2/ From an economic perspective, agriculture is relatively insignificant with regard to total personal income and employment; agricultural pursuits employ less than one percent of the total labor force in the area3/ and contribute comparably to total personal income.4/ However, when agricultural pursuits are considered within the goals and objectives of local planning groups, the simple economic viewpoint is inadequate.

1/ The figures that follow are for Berkshire County and not specifically for the study area. Given the location of agricultural land in the Study Region, and the fact that the region comprises 75 percent of the county, the relative changes within the region and county are comparable in magnitude.

2/ United States Bureau of Census, Census of Agriculture, 1945, Vol. 1, Part 1, New England (U.S. Government Printing Office, Washington, D. C., 1946) p. 160. U.S. Bureau of Census, Census of Agriculture, 1969, Vol. 1, Area Reports Part 4, Massachusetts (U.S. Government Printing Office, Washington, D.C., 1972) p. 17.

3/ United States Bureau of Census, County Business Patterns, 1972, Massachusetts, CBP 22-23 (U.S. Government Printing Office, Washington, D.C., 1973). p. 30.

4/ Glass, Ronald J., Economic Base Survey for Berkshire County, Massachusetts, (United States Department of Agriculture, Economic Research Service, Washington, D.C., 1973). p. 3.

Problems--In recent years, preservation of open space has been a high priority item contained in most local and regional land use plans. In the past, preservation efforts have been primarily concerned with protecting areas of critical concern such as wetlands, flood plains, ridge tops and other areas that have required special considerations to be kept as open space. Many states have enacted protective legislation to secure these areas for the maintenance of their unique and valuable ecologic functions. Recently, however, farmland has been considered for the same level of treatment:

> "Government agencies tend to view the loss of farmland with greater concern than the loss of other forms of open space because farmland, while offering all the inherent values of open space, also provide an economic/employment stimulus. The dual role played by farming--open space and revenue/employment--makes it a highly valuable industry. Its importance, or perceived value, increases as the amount of farmland continues to decrease."1/

Thus, agriculture is more than an industry to preserve simply for the sake of protecting it from further economic demise. It is an industry that contributes more than products and income, for while accomplishing those goals it also provides open space. One of the objectives found in most local and regional plans is to retain a certain mix of land uses which adds aesthetic charm to the landscape. In an area such as the Berkshire Region, which has forestland over nearly three quarters of its area, the retention of open land is necessary to sustain a pleasing mix of land use.

Accepting the proposition that agriculture provides more than an economic contribution, this section discusses changes in agricultural land and also considers its importance as a provider of open land.

The Berkshire Region is not unique with respect to its loss of agricultural land. The trend parallels similar declines in the rest of the state and most

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1/ Miner, Dallas D., "Agricultural Land Preservation: A Growing Trend in Open Space Planning," Management and Control of Growth, Vol. III (The Urban Land Institute, Washington, D. C., 1975). p. 55.

of the Northeast. A listing of the more important factors which have brought on this decline are:1/

1. improved technological and management practices
2. interregional competition
3. competition for human resources
4. competition for land and other resources
5. estate transfer management.

Improvements in technology and management are considered the most important factor in explaining the decline of agricultural land. These improvements resulted in a more intensive farming of the higher quality lands, those being more responsive to additional biological and chemical inputs. Consequently, the improved inputs have been substituted for less productive land and, as a result, agricultural land has decreased.

Changes that have occurred in the dairy industry illustrate the impact of new technology and management on the amount of agricultural land. In the past, most farm operators supplemented pasture and hay roughage with grain concentrates, but following an increasing trend, management has changed to bringing the roughage (usually chopped green) to the herd in the barn. As a result, concentrate and feed grains have been imported and roughage production has switched from primarily hay to corn silage. Such feeding practices, in coordination with better breeding management, have achieved greater milk production per animal. For example, in 1945, the average yield per cow was less than 6,000 pounds. By 1971, the annual production has increased to over 10,500 pounds.2/ This increase has been reflected in the value of dairy products sold. In constant 1967 dollars, a comparison of dairy product sales for Berkshire County reveals that they were valued at $3,925,712 in 1945, but had risen to $5,098,990 by 1969.3/ Thus, while agricultural land declined, the value of output increased.

1/ Portions of the following discussions were adapted from Glass, Ronald J., "The Rivers Reach: Phase I - Some Environmental and Flood Plain Management Implications of the Changing Role of Agriculture," Connecticut River Basin Supplemental Study, New Hampshire, Vermont, Massachusetts, and Connecticut (U.S. Department of Agriculture, Economic Research Service, March, 1974). p. 6-11

2/ Massachusetts Agricultural Statistics, June 1972.

3/ Census of Agriculture, 1945, p. 177; Census of Agriculture, 1969, Section 2, p. 21 (Values were adjusted to constant 1967 dollars using "Prices received by Farmers" index).

The change in feeding management resulted in freeing much pasture land for other uses. Improved seed stocks, increased uses of insecticides and herbicides, along with the changing management trends have made it possible to maintain a relatively stable feed supply while utilizing less land. Such practices have made it economical for farm operators to concentrate their yield increasing inputs on the more productive land. Consequently, steep areas and less productive soils became less intensively used or were completely abandoned. These more marginal lands were often allowed to revert to woodland.

Closely related to the technological trend is the interregional competition the region faces in agricultural production. Although relatively well located in regard to the major Northeast marketing centers (i.e., Boston and New York City), the Berkshire Region is not well endowed with an abundance of high quality agricultural land. The development of super highways made these Northeast markets more accessible to other areas better endowed with such land. In addition, in the last decade, agricultural equipment has been designed for operational methods found on larger productive units. As a consequence, other areas experienced cost developments that gave them a comparative advantage in the Boston-New York marketing area. The changing cost structure in these other areas (Western New York, Ohio, and Indiana) made possible two developments:

1. The areas were able to effectively compete with the Berkshire Region in supplying agricultural commodities to the Boston and New York markets.
2. The areas were able to produce and transport grain and feed supplements to the region at less cost than the region's farmers could produce them.1/

The implication of these developments is that agricultural land in the Berkshire Region decreased as the competitive struggle forced many smaller, marginal farmers out of business.

1/ Glass, Ronald J. "The Rivers Reach...," p. 8.

Human resource competition, involving alternative employment possibilities open to farmers or prospective farmers, also contributes to the decrease in agricultural land. Generally agricultural returns to labor are significantly lower than those in other sectors (especially manufacturing and services). This results in younger generations not entering agriculture. The trend of farm operator age supports this contention: The average age of farm operators in the region is in excess of 53 years, which is higher than the 1964 figure.1/ Thus, as the older operators retire, and as agricultural estates are disposed of, the probability that the land will revert to nonagricultural uses increases. Competition for human resources appears to have contributed to the decline of agricultural land.

Another factor in this decline is competition from nonagricultural land uses. The higher quality agricultural lands are located principally along or on the flood plains within the region, but so are the urban centers of the area. (See Figure 3-2). The value of these better agricultural lands is, therefore, influenced by the demand for residential, commercial, or industrial land. Hence, the price of agricultural land in these areas is not based upon its income producing potential for agriculture, but on its urban or residential development potential. Returns to agricultural pursuits are many times below alternative endeavors. This high cost of agricultural land together with a generally lower rate of return has effectively prohibited the younger generation from entering agriculture.

A final factor contributing to the decline of agricultural land is inheritance taxes. Proper planning and management of agricultural estates tend to minimize the adverse impact that these tax liabilities have on the remaining agricultural land. Estate taxes are based upon the going market prices for land and machinery rather than upon the income-producing potential of such factors, therefore, without sound planning, payment of inheritance taxes often requires that the land and equipment be sold to raise the necessary cash.

1/ <u>Census of Agriculture</u>, 1969. p. 17.

The loss of agricultural land is largely explained by the five factors discussed above. Is this loss a problem? Some would argue that it is not, explaining that if agriculture were competitive with other pursuits, then there would not be a harmful decrease in agricultural land. Others feel that it is definitely a problem and counter the economic competition argument by stating that such a viewpoint is too narrow, does not consider the nature of the resource, and is too short sighted. They state that agricultural land provides more than a medium for producing food and fiber and that the nature of the resource is such that it is renewable if kept in agriculture but is not if it is developed. In the event of more serious energy shortages or similar occurrences, resultant increases in production, marketing and transportation costs and subsequent higher consumer food prices; social and political instabilities could ensue.

Presently, Massachusetts imports nearly 85 percent of its food and fiber requirements. This import trend, coupled with continuing lower state production, is expected to become more severe. Recently, a conference sponsored by the Cooperative Extension Service, the University of Massachusetts, and the United States Department of Agriculture heard the Massachusetts Commissioner of Agriculture state the possible repercussions of increased loss of farmland:

> "If the land and water base of Massachusetts is covered up, polluted, or otherwise lost, we stand to lose farms, food production from land and water, and a decline of farm profitability, with a resultant dependence upon imported food, severe economic loss to the state and increased food prices."1/

Although the Berkshire Region produces only six percent of the total value of farm products sold in the state, any loss of its contribution would be felt in increased imports.

Agricultural land serves purposes other than food and fiber production. As agricultural land disappears, so too does open space. When agricultural land is developed, abandoned or otherwise allowed to revert to forestland, the aesthetic values of the countryside are diminished to the extent that diversity of landscape patterns or contrasts are decreased. The Berkshire Region is

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1/ Le Mon, Warren and Neil L. Perry, <u>The Greenfield Recorder</u>, Greenfield Massachusetts, February 4, 1976. p. 1.

renowned for its beautiful fall foliage coloration and it is made even more spectacular by its contrasting forest and open lands.

Ecologically, open land provides a great deal of "edge" when juxtaposed with woodland. Most species of wildlife feed at the edge or boundary of open and dense areas. As open land diminishes, edge is reduced resulting in a decrease of quality wildlife habitat.

Objective

A primary objective of this study is to offer various alternatives through which the preservation of agricultural land may be realized. The preservation of such land is not emphasized solely for preserving agriculture, but also for the reason that agriculture may be the least cost means of providing and preserving open land. Local preservation measures are primarily aimed at maintaining the environment and the quality of life. However, goals of most agricultural land use legislation have also been economic: to preserve property values, to control the cost of providing services, to maintain the competitiveness of an area for tourism, or to attract people with professional skills to the community. Groups affected by the economic impacts of land use programs want to know about program costs and benefits.

In most states, preservation programs are jointly administered by state and local governments. In many instances, depending upon the type of program, cost sharing arrangements are also available. Generally, there are two methods open to local governments in preserving open land:

1. enact regulations to guide density of development;
2. purchase land in fee simple or purchase development rights.

Under the first method, through the enactment of state enabling laws, most local governments have the legal entitlement to regulate land use by permitting or denying techniques of development. For example, a town may permit clustering which requires that the buildings be placed on a specified acreage leaving the remaining land in the parcel open or in agriculture. The town of Columbia, Maryland has been quite successful with this technique. Towns can also set up various types of zoning: agricultural, conservation and/or extremely low development densities.

The second method usually involves state participation (either from a planning perspective or from a financial perspective or both). Under this scenario, towns might purchase certain acreage or purchase easements (development rights) to prohibit specified uses.

A number of states have passed legislation enabling local governments to purchase development rights to agricultural land.1/ In the same conference alluded to previously, the Massachusetts Commissioner of Agriculture stated that Massachusetts is considering a program whereby development rights could be purchased from agricultural land. Under such a program, the state or local governments could purchase rights from landowners to prevent other than agricultural uses. The dollar value of these rights would in all likelihood be determined by the difference between the value of land used in agriculture and the value of such land developed for more intensive uses.

Forestland

Problem--The abundant wood resources in the forest of the Berkshire Region are not being utilized to their fullest potential. This principle forestland problem is caused by four interrelated factors:

1. ownership patterns, attitudes and knowledge of owners
2. a maturing forest and decline in harvesting activities
3. absence of timber markets and skilled labor
4. urban encroachment on productive forest areas.

A significant factor which contributes to the overall problem of underutilization of forest resources is the ownership pattern. (Figure 3-3 illustrates ownership patterns and existing uses). Table 3-5 illustrates the size of holdings and the percentage each contributes to the total area. As these data demonstrate, most of the forestland in the region is privately owned and in small parcels.

The attitudes and knowledge of forest landowners contribute to the underutilization of forest resources in the region. The lack of knowledge on proper management practices is probably the most serious factor. Two studies

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1/ New York and New Jersey are two states that have passed such legislation. Maryland has passed a similar type bill but is limited to productive agricultural land.

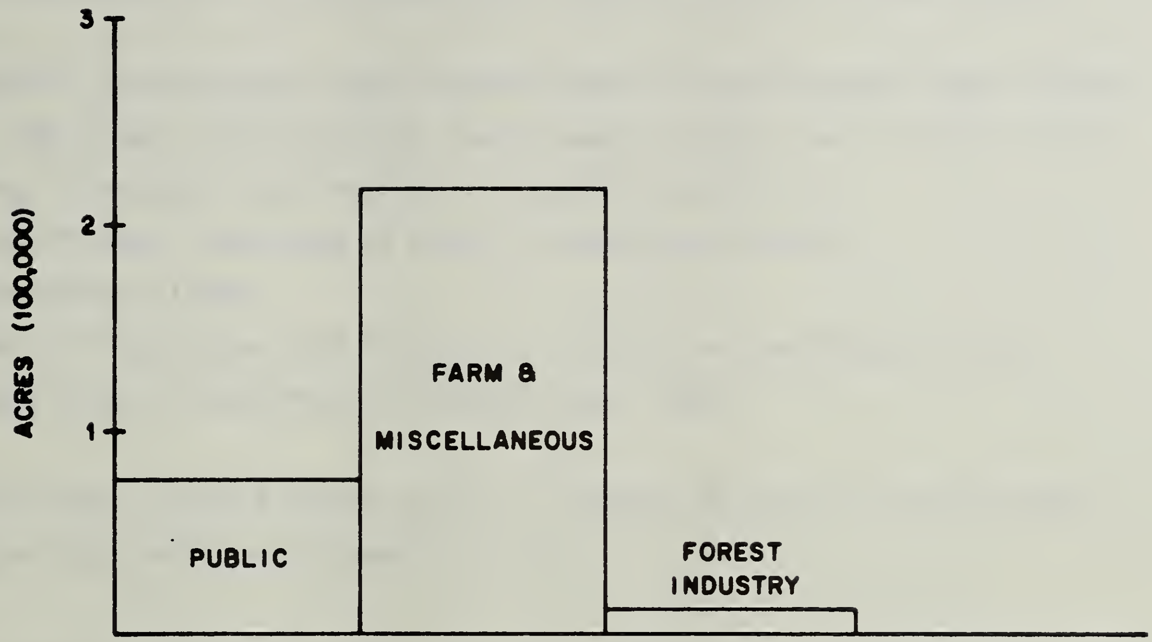

FIGURE 3.3a FOREST LAND OWNERSHIP

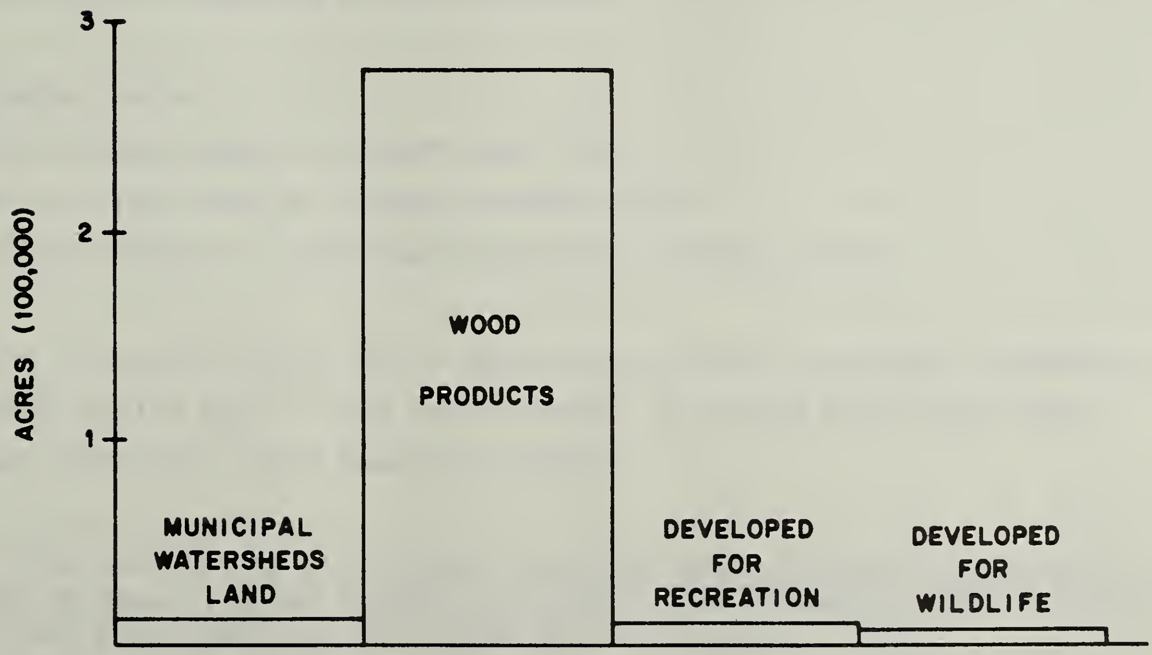

FIGURE 3.3b FOREST LAND USE

FIGURE 3.3

FOREST LAND OWNERSHIP AND USE

dealing with forest owner characteristics and attitudes delineate some of the variables that have minimized past forest resource utilization.1/

Both studies investigated why woodland owners do not harvest their timber. In the 1965 study, 93 percent of these owners listed one or more of the following as reasons why they did not permit cutting:2/

1. insufficient knowledge of what or how to sell (25%)
2. disinterest (25%)
3. fear of destroying the forest, its beauty and usefulness (34%)
4. opposition to cutting in forested areas (9%).

The 1972 study listed similar results although the lack of merchantable timber was the reason most owners gave.3/

The two studies indicate rather forcefully that many of the woodland owners have not used and/or are not aware of available forestry services. In the 1965 study, 35 percent of those who have not used forestry services stated that they had no knowledge of the services.

Other reasons were:

1. woodland too small to bother with (31%)
2. not in a position to use the services (28%)
3. did not believe in government-supported programs (6%).

Apparently the need exists for an educational effort to supply information which would assist many of the forest owners in making more intelligent decisions concerning their woodland holdings.

1/ Marrama, Philip M., Private Woodland Owner Characteristics and Attitudes in Berkshire and Franklin Counties, Massachusetts, (Massachusetts Agricultural Experiment Station, Amherst, Massachusetts, 1972).

Babeau, Richard G., Arnold D. Rhodes and William P. MacConnell, Forest Owner Characteristics and Attitudes in Berkshire County, Massachusetts, (Massachusetts Agricultural Experiment Station and Cooperative Extension Service, Amherst, Massachusetts, 1965).

2/ Babeau, et al., p. 29.

3/ Direct comparisons between the two studies cannot be made since the sampling methodologies were quite different.

TABLE 3-5 - SIZE OF FORESTLAND HOLDINGS, BERKSHIRE COUNTY, MASSACHUSETTS

Size of holdings in acres	Percent of acres	Number of owners	Percent of owners
3 - 9	1	364	19
10 - 24	4	380	20
25 - 49	8	352	19
50 - 99	17	366	20
100 - 249	31	295	16
250 - 499	21	89	5
500 and over	18	29	1
Total responding	100	1,875	100
Question not answered		52	
Total Respondees		1,927	

Source: Babeau, Richard G., Arnold D. Rhodes, and William P. MacConnell, Forest Owner Characteristics and Attitudes in Berkshire County, Massachusetts, (Massachusetts Agricultural Experiment Station, Amherst, Massachusetts, 1965).

The attitude of the vast majority of forest landowners in the region is favorable toward good forestland management. As a proportion of the total region's woodland owners, less than nine percent can be considered strict preservationists.1/ Thus, with an educational effort directed toward the forest landowners who are not fully cognizant of modern forestland management practices, negative attitudes toward harvesting may be reversed. This position is further supported in that 91 percent of the resident and 68 percent on the nonresident forest owners held the opinion that logging could be carried out in such a manner as to minimize forest destruction.2/

The second major factor hampering total forest resources utilization is the lack of proper harvesting practices. Much of past forest cuttings have consisted of a practice known as "high grading". This involves harvesting the best trees and leaving the diseased and poor quality trees. A direct result is that only 18 percent of the softwood timber and 29 percent of the hardwood timber are suitable for high quality lumber (log grades 1 and 2).3/

1/ Babeau, et al., p. 29.
2/ Marrama, p. 32.
3/ USDA, Forest Service, The Timber Resources of Southeastern New England (Northeastern Forest Experiment Station, Upper Darby, Pennsylvania), 1974 .p. 3.

In recent years a decline in timber harvesting has allowed an increase in the general age and stocking of the existing forest. Consequently, the maturing forest has begun to close in. The canopy has thickened and the lowgrowing berries, herbs and wild flowers have dwindled resulting in smaller populations of wildlife.

Berkshire forests are primarily composed of Northern Hardwood stands and, if left untouched, will eventually reach a climax of almost pure beech and hemlock, the only species that can tolerate dense shade. About half the forestland is presently in larger sawtimber size trees. Thirty-four percent of the stands are densely stocked pole-size stands. If such a succession is permitted to continue, the mixture of habitats necessary for the survival of numerous wildlife species will disappear. With only one age class and two or three species of flora, the potential for insect and disease epidemics is vastly increased.

The third major factor is a lack of markets for available products and the skilled labor necessary to harvest them. The application of practices to improve forest productivity and other uses is dependent on the availability of good diversified markets for wood products and skilled labor. There is presently, however, a poor market for small low-grade logs and a limited number of trained woods workers. Thus, the estimated annual harvest is less than half the present annual timber growth. The private landowner has little incentive to improve forest stands for future returns because he does not have a market for material that is removed in thinning. This situation significantly alters the otherwise favorable economic outlook for the availability and use of forest resources.

Thirteen sawmills and three secondary lumber processing mills compete for the available logs. By the year 2020, lumber production is projected to decrease 35 percent in the region. Presently there are 15 papermills and seven secondary paper processing mills, none of which use wood in roundwood form. The annual production of about 80,000 tons of paper is estimated to double by the year 2020. If a pulpmill were established in Western Massachusetts to utilize roundwood from the forests, at least 5,000 tons of wood pulp would be produced annually from thinnings on an estimated 500 to 1,000 acres. If a

particleboard plant were established, wood residues from sawmills and some lower value logs could be utilized. Improved markets would provide an incentive for better forestland management.

The final factor contributing to the poor utilization of the forest resource is urban encroachment. While the total acreage of forestland has slightly increased from the succession of former agricultural land, subtle changes are taking place as a result of an "urbanizing effect".

Open space areas are being subdivided into smaller and smaller lots, compounding the problem of small private ownership. This is particularly true with lake front developments.

Urban growth is advancing into forested acres at the rate of about 150 acres per year. Improper land development causes erosion, water pollution, and loss of wildlife habitat. Timber resources are also being wasted. The recent forest survey of Southern New England estimated that only about 17 percent of the timber removed in land use changes is converted to wood products.

Objective

The primary objective for forestland use is to increase the flow of goods and services through integrated land management and utilization practices. On private land this means that twice as many owners must be encouraged to apply sound forest management practices. Since the number of owners is increasing, there must also be an increase in available technical services to assure that soil and water values are protected.

Other Land

As mentioned in Section 3.2 the "other" land use category is an aggregation of five subcategories, and presently comprises nearly seven percent of the area.

Problem -- "Other" land as a particular use does not pose a serious problem. As a category, however, most of this land is open and in some stage of transition to forestland. To the extent that visual quality is related to a

diversified land cover mixture, a substantial reduction in unforested, undeveloped land may be cause for concern. Much of this transitional land (primarily abandoned agricultural or orchard land), excepting certain obvious subcategories, will revert to forestland. If a diversification of land use is a desirable end, some means should be considered to counter this transition.

Objectives--Overall objectives of this study are to delineate alternatives whereby economic development and social well-being may be enhanced, while insuring that environmental quality is not adversely effected. In viewing the "other" land category, it appears that the overall objectives will not be met if this land use category is permitted to expand and then revert to forestland. Alternatives offered in this study are designed to minimize the increase in the "other" land use category by reducing the transition from the other pertinent categories.

Urban Land

Developing detailed problem statements and objective statements on the urban land category is beyond the scope of this study.

3.6 Needs

Before alternatives can be offered, the needs of the region must be identified. This section delineates the general regional needs and those of particular land use categories when applicable.

Regional Needs

One of the most important regional needs is to complete the soil survey. These surveys are extremely useful in providing an inventory of soil types, in providing soil interpretations for guiding certain land uses (e.g., where homes with septic systems can be located), and in providing critical area locations (e.g., wetland soils, steep slopes, etc.).

1/ As of January 1976, Clarksburg, Lee, Lenox, Great Barrington, Sheffield, Pittsfield and Stockbridge have had their soils mapped.

Another need which may be larger than a regional need is to ascertain how much open and/or agricultural land has been sold because of inheritance liabilities. If it is found that a significant amount of such land has been sold for reasons of tax liabilities, an investigation might be undertaken to determine the feasibility of a program limiting such liabilities.

Another important need is to accelerate land use planning in the region. The Berkshire Region has experienced an increase in second homes, especially in the ski and other recreational areas. Land use control is imperative because soil characteristics may be such that high density development may contaminate ground or surface water supplies. Under such circumstances, the affected municipalities may be forced to supply wastewater collection and treatment facilities resulting in increased tax rates to finance such expenditures.

Soil conditions may prohibit individual septic systems. Other development schemes may, therefore, be required (such as cluster development, planned unit developments, etc.) which will facilitate a communal waste collection and treatment system.

Good land use planning is required if growth is to be controlled. Many recent court cases have supported municipal growth control tactics, particularly where such tactics were tied to a land use plan and met general welfare criteria. Those towns without such plans usually lost their day in court. For without a plan, land control policies are considered arbitrary and thus, compensation to adversely affected owners is due (i.e., the taking issue). Good land use planning must meet three criteria:

1. The enactment must be reasonably calculated to achieve the purposes for which it was designed.
2. Zoning regulations must not single out individuals for unusually harsh burdens.
3. Regulations must treat similar properties in a like manner.1/

1/ Babcock, Richard F., and Fred P. Basselman, "Land Use Controls," Management and Control of Growth, Vol. I (Washington, D.C., The Urban Land Institute, 1975) p. 198.

Finally, if flood plains and flood prone areas are not to be developed, it is necessary to accelerate flood plain delineation programs. The HUD administered National Flood Insurance Program provides municipalities with flood plain delineation. This program will be discussed in the Flooding Chapter.

Agricultural Land Needs

As mentioned in Section 3.5, the largest problem facing the agricultural sector is the decrease in agricultural land. Accepting this, there is a need to develop some type of program to minimize or reverse the trend of disappearing agricultural land. Farmland plays a dual role: It provides open land and income/employment which makes agriculture a highly valuable industry. "Its importance, or perceived value, increases as the amount of farmland continues to decrease."1/

Forestland Needs

1. Efforts should be increased to reach the 1,400 forest owners, controlling approximately 148,100 acres, who have not been reached by any of the forestry programs.

Slightly over 50 percent of the total forest area is under some form of resource management, but only about 32 percent of the private non-industrial forestland is managed. Since private ownership changes on the average of every five years, there will be a continuing need for forestry assistance and advice.

The Massachusetts soil and water conservation needs inventory indicates that 67 percent of the forestland in the region needs timber stand improvement and 49 percent needs multiple use management.

2. Renewable resource management systems must be directed toward maintenance of more productive conditions.

The needs for improved timber growth and wildlife habitat can both be met by creating more diverse forest stand conditions. Timber harvesting can be used to substitute technology for nature's harsher methods--fire, windstorms or insect and disease damage.

1/ Miner, Dalles, D., p. 55.

3. Better utilization of wood resources is a high priority.

The recommended forestry programs can best be accomplished while supplying the needs of wood-using industries. This is the least costly method of improving forest productivity through removal of over-mature and small lower grade trees.

If a pulpmill utilizing roundwood was established in Western Massachusetts about 5,000 tons of wood pulp could be produced annually, principally from thinnings on 500 to 1,000 acres each year.

Excessive volumes of small poor quality logs and other residues could be utilized by board product industries such as particleboard plants.

Two recently conducted feasibility studies listed the major constraint facing prospective new industry as the lack of guaranteed long-term raw product supplies.1/ If an acceptable method could be devised for assuring the procurement of such supplies, the primary reason for wood-using firms not to locate in the area would be greatly diminished.

4. Designating and preserving open space areas is the best available means for protecting most forest resource values from creeping urban growth.

Potential natural areas, town forests, scenic trails or wild, scenic and recreational rivers can be designated based in part on information compiled during this survey. In addition, there are up to 5,000 acres of private holdings that should be acquired to more effectively manage state forest areas.

There are sufficient renewable resource programs to meet the forest resource needs of the Berkshire Region. The results of this survey point to a need to concentrate on efforts to utilize forests to their fullest potential.

1/ Daly, John D., Harold B. Gatslick, and William S. McNamara, The Feasibility of Plywood Manufacture in Berkshire County, Mass., (Cooperative Extension Service, University of Massachusetts, Amherst, 1972).
Weidhaas, Nicholas C., The Feasibility of Particleboard Manufacture in Berkshire County, Mass. (Master Thesis, University of Mass., Amherst, 1965).

A number of states have introduced the concept of the public purchasing development rights to agricultural land, and thus, precluding other uses. Such a program is a combination of the regulatory and incentive approaches. It is regulatory in the sense that agricultural areas must be designated for preservation and it includes incentives since the income derived from the buying of the development rights can be reinvested in the farm firm to increase efficiency and net borrowing power and, thereby, increase its competitiveness.

The public investment required in a development rights program is dependent upon the difference in the value of land used for agriculture and the value if the land were used for development. Thus, in areas that are in close proximity to higher value uses (e.g., adjacent to urban areas), the public costs per acre in purchasing the development rights would be higher than in areas located farther away. After the development rights are purchased, no other uses would be permitted. Such a program has two advantages over those previously mentioned:

1. The sale of development rights will provide compensation to owners of restricted areas.
2. Prospective farmers will require less financial resources to enter farming since land prices will be based on agricultural earnings rather than upon potential development values.

Another program, recently introduced in the South Dakota legislature, involves the state purchase of agricultural land which is then leased back to a farmer. Although such a program is relatively easy to administer, the initial investment is clearly beyond the fiscal capabilities of most local governments, especially if it were applied to larger areas. In areas of critical importance, such as flood plains, or in areas with unique inherent qualities (a gorge or the like), a purchase leaseback arrangement may be the only effective means of effecting preservation.

Table 3-6 summarizes the component needs of agricultural land and the various alternatives through which such needs may be satisfied.

Forestland

There are three policy alternatives appropriate for the forest sector: (1) manage the forest resources for multiple uses (2) preserve existing forest qualities and, (3) manage solely to increase wood products.

The most suitable alternative is multiple use management which addresses all the component needs of the forest sector.

TABLE 3-6 - SYSTEMS FOR PRESERVING AGRICULTURAL LAND

Component Needs	A Zoning and Preferential Assessment	B Purchase Leaseback	C Development Rights
1. Maintain or increase agricultural protection	No	Yes	Yes
2. Maintain or increase environmental and aesthetic qualities	No	Yes	Yes

The preservation alternative gives priority to the designation of forestland for passive recreation uses, but excludes management for wood products. Table 3-7 summarizes the three forestland alternatives with the respective benefits to the component needs as identified in Section 3.6.

TABLE 3-7 - MANAGEMENT SYSTEMS FOR UTILIZING FORESTLAND RESOURCES

	Alternatives		
Component Needs	A Manage for Multiple Uses	B Preserve Existing Qualities	C Manage for Wood Products
1. Increase productivity of forestland	Yes	No	Yes
2. Increase fish and wildlife habitat	Yes	No	Yes
3. Increase utilization of wood supply	Yes	No	Yes
4. Minimize urban growth effects	Yes	Yes	No

CHAPTER 4 - FLOODING

4.1 SUMMARY

Within the last 50 years many floods have occurred in the Berkshire Region. Significant regional floods occurred in 1927, 1936, 1938, and 1948-49. These floods damaged residences, commercial buildings, industrial plants, farm fields, roads, and bridges.

Average annual flood damage in the region exceeds $800,000. A 100-year frequency flood would cause damage in excess of $13.5 million.

To reduce flood hazard risks in future development, many towns in the region are adopting flood plain management techniques such as flood plain zoning and flood insurance. All but four towns have joined the National Flood Insurance Program and property owners can now purchase low cost flood insurance. In return for this federally-subsidized insurance, the towns are required to regulate future construction within flood hazard areas.

As a result of the flood insurance program and the growing tendency to adopt flood plain management measures, future flood plain development is expected to be highly restricted. As a consequence, flood damage is not expected to increase significantly.

Flood plain regulations and flood insurance will not reduce flood damage to existing development. There is a need to develop alternatives to reduce flood damage in the region to an acceptable level.

Alternatives are available to significantly reduce flood damage. Three combinations of corrective flood plain management techniques were investigated in this study. Floodproofing, structural measures, or a combination of floodproofing and structural measures offer viable alternatives to continued flood damage.

4.2 Resource Base and Existing Programs

Figure 2-1 illustrates the location of the major river basins and subwatersheds within the Berkshire Region.

The flood plains of the upper Housatonic basin are generally narrow and undeveloped in the upper reaches in Hinsdale and Lanesborough. In Pittsfield and Dalton, however, the flood plains are somewhat wider with significant commercial and industrial development. Large wetland tracts are found in the headwaters of the East and Southwest Branches and the Unkamet and Brattle Brook areas of Pittsfield along the East Branch.

The lower Housatonic River flood plains are wide with soils generally well suited for agriculture. There are limited areas with marshes and swamps. The flood plains are relatively free of urban encroachment except for the town centers of Lee and Great Barrington.

Upstream of North Adams, the North Branch of the Hoosic River flood plain is generally broad, flat, and undeveloped. Approaching North Adams the flood plain becomes narrow and restricted. Through the city the North Branch is confined within a concrete channel protecting urban development.

The South Branch flows in a northerly course from Cheshire Reservoir in Cheshire to its confluence with the North Branch in North Adams. The flood plain is generally quite wide and undeveloped, with the exception of the town center and approaches. The South Branch is also confined by concrete walls or earth dikes for much of its length through Adams.

The Hoosic River from North Adams to the North Adams-Williamstown town line flows through several reaches of improved channel. Downstream through Williamstown, the flood plain is quite wide, generally unforested, and relatively undeveloped.

Within the last 50 years, the Berkshire Region has experienced numerous floods. Significant regional floods occurred in 1927, 1936, 1938 and 1948-49. In addition, portions of the region were affected by intense local storms in 1933, 1945, 1955, 1968 and 1973.

The most recent flood affecting the entire region occurred on New Year's Eve - 1948. The flood was the result of a three-day storm which deposited rainfall amounts ranging from 5-12 inches over the region. For the most part, snow cover was light and had little effect on the magnitude of flood discharges. The streams began to rise on December 30 and reached their peak on December 31 in Hoosic River Watershed, Kinderhook Creek and the Upper Housatonic. The Housatonic River peaked on January 1 in Great Barrington. The flood stages and peak discharges in the Hoosic River Watershed and the Upper Housatonic Study Area failed to reach the record levels of September 1938. However, a new peak discharge was recorded on the Housatonic River at Great Barrington.

The New Year's Flood was the most costly to date. In Pittsfield municipal damages totaled $100,000 including roads, bridges, and pipelines.1/ Sewer and water lines were broken throughout the city adding health hazards to severe flood problems. Three feet of water was reported in some industrial plants. In Lenox, municipal damages exceeded $25,000. Industries in Lee report damages of at least $50,000. In Great Barrington damages approached $750,000, including $350,000 damage incurred by industrial plants, $50,000 damage to the Great Barrington Fairgrounds, and $250,000 damage to bridges. As a result of industrial damage, 900 employees were out of work. The center of Sheffield was an island and the NYNH&H Railroad running through the town sustained severe damages in the form of track washouts. Over 100 people in North Adams were evacuated by the National Guard. It was reported that Berkshire County sustained over $2,000,000 (1949 dollars) in damages from this storm.

1/ Price base 1949.

Field investigations made by the Soil Conservation Service indicate that average annual flood damage in the region exceeds $800,000 and that a 100-year frequency flood would cause damage in excess of $13.5 million. Average annual damages and damage expected from a 100-year flood in each of the region's subwatersheds are summarized in Table 4-1. Projected flood damages for the year 1990 are also presented in Table 4-1. These data are also graphically illustrated in Figure 4-1.

Historically, many industries were located on the flood plain because water was necessary for plant operations. The alternative of developing in the uplands was more costly since it meant substituting a more expensive energy source if water was needed for power or transporting plant wastes a greater distance if water was needed as a discharge medium. Roads were developed on flood plains because of lower installation costs--it was less expensive to build on the flat valley lands than to route highways over rugged upland terrain. Residential building was the result of lower site development costs associated with flood plain lands. In addition much residential development was stimulated by the existing industrial flood plain development, i.e., housing for factory workers was often located on the same flood plain as the factory for convenience.

In flood plain development, one significant cost determinant was often excluded from the decision making process--this being the cost of flood damage. In some instances, the flood hazard was not recognized. In others, the hazard was recognized but the severity was misjudged. In still other cases, federal disaster assistance after the flood encouraged rehabilitation of flood damaged property in the same location.

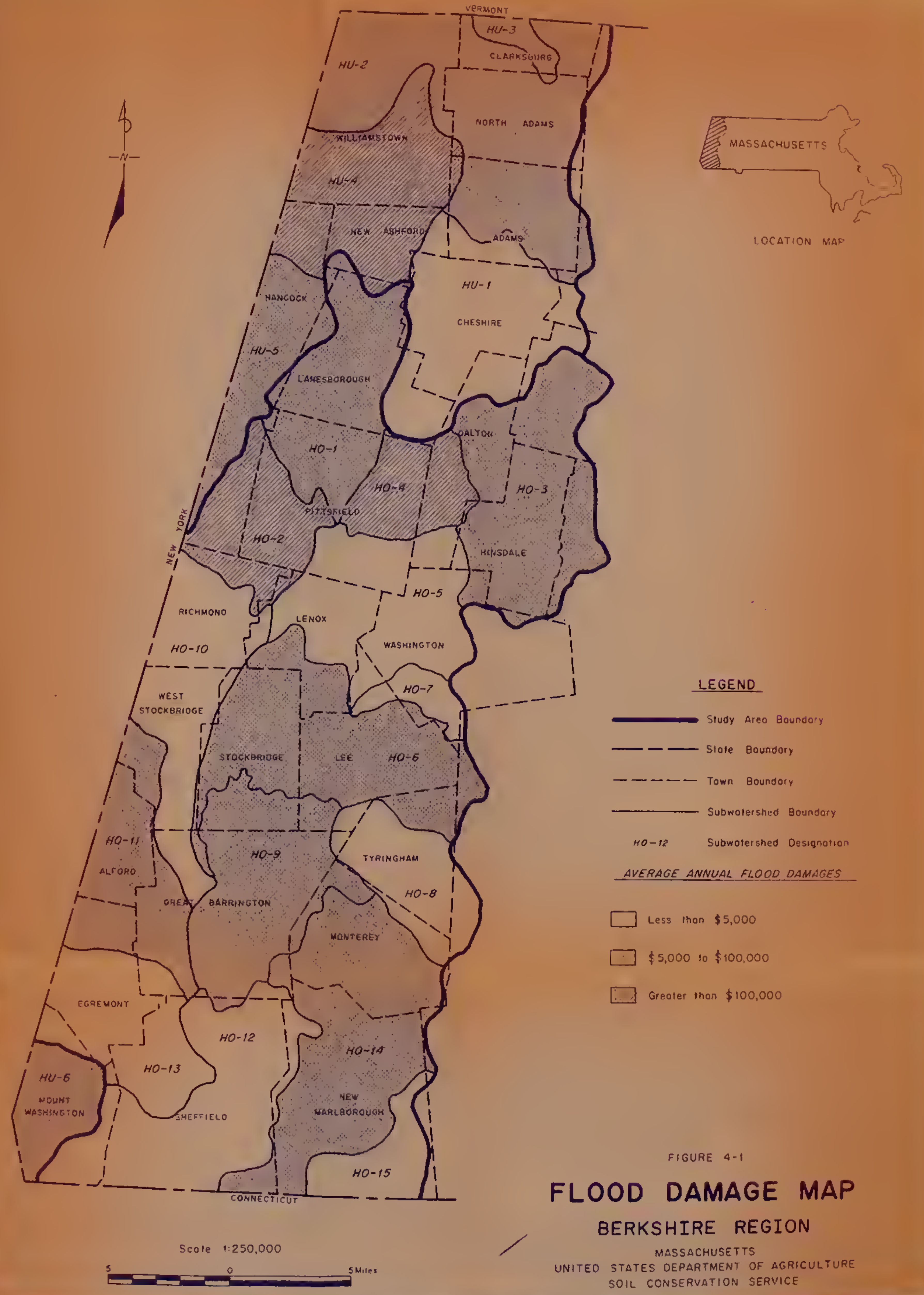

FIGURE 4-1

FLOOD DAMAGE MAP

BERKSHIRE REGION

MASSACHUSETTS
UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

TABLE 4-1 FLOOD DAMAGES 1/

Subwatershed	Average Annual Damage 1975 Conditions	Average Annual Damage 1990 Conditions	100-Year Flood Damage 1975 Conditions	100-Year Flood Damage 1990 Conditions
HO-1	29,000	30,000	480,000	490,000
HO-2	134,000	135,000	2,230,000	2,240,000
HO-3	27,000	28,000	460,000	470,000
HO-4	187,000	189,000	3,120,000	3,140,000
HO-5	2/	2/	2/	2/
HO-6	94,000	95,000	1,560,000	1,590,000
HO-7	70,000	2/,3/	1,170,000	2/,3/
HO-8	2/	2/	2/	2/
HO-9	29,000	29,000	480,000	490,000
HO-10	2/	2/	2/	2/
HO-11	9,000	7,000 4/	150,000	110,000 4/
HO-12	2/	2/	2/	2/
HO-13	2/	2/	2/	2/
HO-14	19,000	19,000	310,000	320,000
HO-15	2/,5/	2/,5/	2/,5/	2/,5/
HU-1	2/	2/	2/	2/
HU-2	8,000	8,000	130,000	130,000
HU-3	7,000	8,000	120,000	130,000
HU-4	155,000	157,000	2,580,000	2,620,000
HU-5	9,000	9,000	150,000	160,000
HU-6	23,000	16,000 6/	380,000	270,000 6/
Watersheds with less than $5,000 Average Annual Damages	24,000	22,000	400,000	370,000
TOTAL	824,000	752,000	13,720,000	12,530,000

1/ Price Base - 1975

2/ Less than $5,000 average annual and less than $80,000 for 100-year flood.

3/ Washington Mountain Brook PL 566 Project will reduce damages below $5,000 average annual.

4/ Corps of Engineers Project on Green River will reduce damages.

5/ Blackberry River PL 566 Project has reduced damages below $5,000 average annual.

6/ Assumes installation of RC&D Critical Area Treatment Measures.

Within the past decade, there has been a growing awareness of flood hazard potential and with it the realization that the risk of flood damage should be considered as a cost factor affecting development decisions. Federal, state and local agencies have been concerning themselves with regulating and/or discouraging flood plain development. To reduce flood hazard risks in future development, many towns within the region are adopting one or more flood plain management techniques. These flood plain management measures have the major effect of reducing future flood damage by informing people of risks involved in flood plain development and by imposing legal penalties for such development. Examples of these techniques include flood plain zoning, conservation zoning, and those included in the HUD Flood Insurance Program. According to the U. S. Department of Housing and Urban Development (HUD), flood plain management involves the following:

> Flood plain management means the operation of an overall program of corrective and preventive measures for reducing flood damage including, but not limited to, emergency preparedness plans and any regulations aimed at the future use of the flood plain. Such regulations refer to specific local codes and ordinances which provide standards for the location and design of new development within flood prone areas. These regulations may be adopted in any manner that is legally enforceable for a particular community, and typically take the form of portions of zoning, subdivision or building regulations, or a special purpose ordinance such as a flood plain ordinance. As a condition of participation in the National Flood Insurance Program, a community must adopt flood plain management regulations meeting minimum standards published by FIA (Federal Insurance Administration).[1/]
>
> The minimum standards are also set forth by HUD:
>
> A community must: (1) require building permits for all new construction and substantial improvements and (2) review the permit to assure that sites are reasonably free from flooding. For its

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1/HUD News, U.S. Department of Housing and Urban Development, Washington, D.C., 20410, March 10, 1975, page 9.

flood prone areas, the community must also require: (1) proper anchoring of structures, (2) the use of construction materials and methods that will minimize flood damage, (3) adequate drainage for new subdivisions, and (4) that new or replacement utility systems be located and designed to preclude flood loss.[1/]

As of January 1, 1976, all but four towns in the region had joined the National Flood Insurance Program, and property owners can now purchase low cost flood insurance protection. In return for this federally-subsidized insurance, the towns are required to consider flood hazards before issuing building permits, subdivision approvals, or zoning variances. After detailed hydrologic and hydraulic studies are made, HUD will issue flood zone maps which accurately delineate the flood hazard area and depth of flooding. Local governments must then require that all new construction be above the 100-year flood elevation. Most financial institutions must require that flood insurance be purchased on any property within the flood hazard zone on which mortgages are accepted.

As a result of the flood insurance program and the growing tendency to adopt flood plain management measures, future flood plain development is expected to be highly curtailed. As a consequence, flood damage is not expected to significantly increase.

Unfortunately, flood plain regulation and flood insurance do not reduce flood damage to existing property. Removal or relocation of buildings, presently located on the flood plain, will eliminate these potential flood damages. However, removal costs are often more than the value of flood damages. In some cases, structural measures such as dams, floodwalls, and channel enlargement are necessary to protect flood plain development. The floodwalls, dikes, and concrete channels in Adams and North Adams are perhaps the best known flood protection measures in the region.

1/HUD News, U.S. Department of Housing and Urban Development, Washington, D. C., 20410, March 10, 1975, page 9.

Several flood protection projects are now in the final design or construction stage in the Berkshire Region. The structural measures that are a part of these projects will do much to reduce future flood damage in specific subwatersheds. Among the projects are the Washington Mountain Brook Public Law 83-566 Watershed Protection and Flood Prevention Project, the Corps of Engineers Channel Improvement Project on the Green River in Alford, and the Critical Area Treatment in the Bashbish Brook subwatershed, a Berkshire-Franklin Resource Conservation and Development measure. More specific information about the components of each project may be found in Appendix A, Hydraulic and Hydrologic Data.

4.3 Problems and Objectives

Flood plain management, the flood insurance program, and existing flood protection projects are expected to limit average annual flood damages in 1990 to slightly below present levels, or about $750,000. Occurrence of a 100-year flood in 1990 would produce damage in excess of $12.5 million. Flood damages can be expected to occur to residences, commercial buildings, industrial plants, and roads and bridges. Plant closings, loss of employment, inconvenience, and hazards to life, health, and safety add to the damage. Periodic flooding lowers the quality of life in the region by endangering lives and property and by disrupting economic and social activities.

The objective of this study of flooding is to develop alternatives to reduce flood damages to an acceptable level. The definition of "acceptable level" is subject to discussion. For a low income family, one hundred dollars in flood damage would probably represent an unacceptable price to pay for the economic advantages of being located near the river.

For the purposes of the study, average annual damage of less than $5,000 was considered an acceptable level in each subwatershed. In other terms, this is about equivalent to a 100-year frequency flood causing $80,000 in damage.

4.4 Needs

Thirteen subwatersheds in the region are expected to have average annual flood damages in excess of $5,000 in 1990. The subwatersheds and major damage areas are indicated in Figure 4-2. The needs are to reduce flood damage in each of these problem areas.

4.5 Alternatives

Flood damages can be minimized by careful planning and implementation of flood plain management techniques. Flood plain management programs should contain regulatory and corrective measures.

Regulatory measures do not prevent flooding, but instead reduce the threat of damage or loss of life from floods by discouraging development on flood plains. Regulatory measures include flood plain regulations, development policies, land use restrictions, greenbelts or open space and flood insurance. Tax adjustments and warning signs are related measures.

Corrective measures, while they do not eliminate flooding, can reduce the extent of flooding and resulting damages. These corrective measures are usually physical measures and can include land treatment, floodwater retarding structures, stream improvements, levees or floodwalls, existing reservoir management programs, floodproofing of structures, relocation of buildings or flood plain reclamation, and flood watch and warning systems.

As noted previously, regulation of development on flood plains is expected to effectively limit increases in flood damages. Corrective measures will also be needed to reduce damage to existing development.

Corrective measures, as described below, are usually physical measures that are designed to reduce or control floods and flood damage.

Land Treatment--Vegetative and mechanical land treatment measures can be installed on the uplands to prevent destruction of land by erosion and reduce the movement of damaging amounts of sediment to the streams and flood plains. Agricultural lands and lands in transition from agriculture to urban uses should be protected or maintained by temporary vegetation, mulch, sediment basins or other measures to reduce and control erosion. Land treatment measures also slow or reduce runoff and peak flood flows from upland areas.

Floodwater Retarding Structures--These structures are earthfill or concrete impoundments that check the uncontrolled flow of floodwater rushing downstream. The structures are located to protect the largest possible area of land subject to flooding, encroach as little as possible on high value lands, and provide a high level of protection to downstream property.

Stream Modifications--Stream channel changes to increase channel capacity to carry floodwater can be made by straightening, deepening, widening, clearing, or by lining the channel so that flooding will be less frequent and severe.

Dikes and Floodwalls--These are earth embankments or concrete walls built along the bank of a stream to confine flood flows to the channel or floodway. Dikes and floodwalls are normally used to provide protection to high value flood prone areas.

Floodproofing of Buildings--Techniques used to make existing buildings, contents and grounds located in flood hazard areas less vulnerable to flood damage are:

1. Permanent measures built as an integral part of the structure, such as: raising the elevation of the structure, waterproofing of basement and foundation walls, anchorage and reinforcement of floors and walls, and use of water-resistant materials

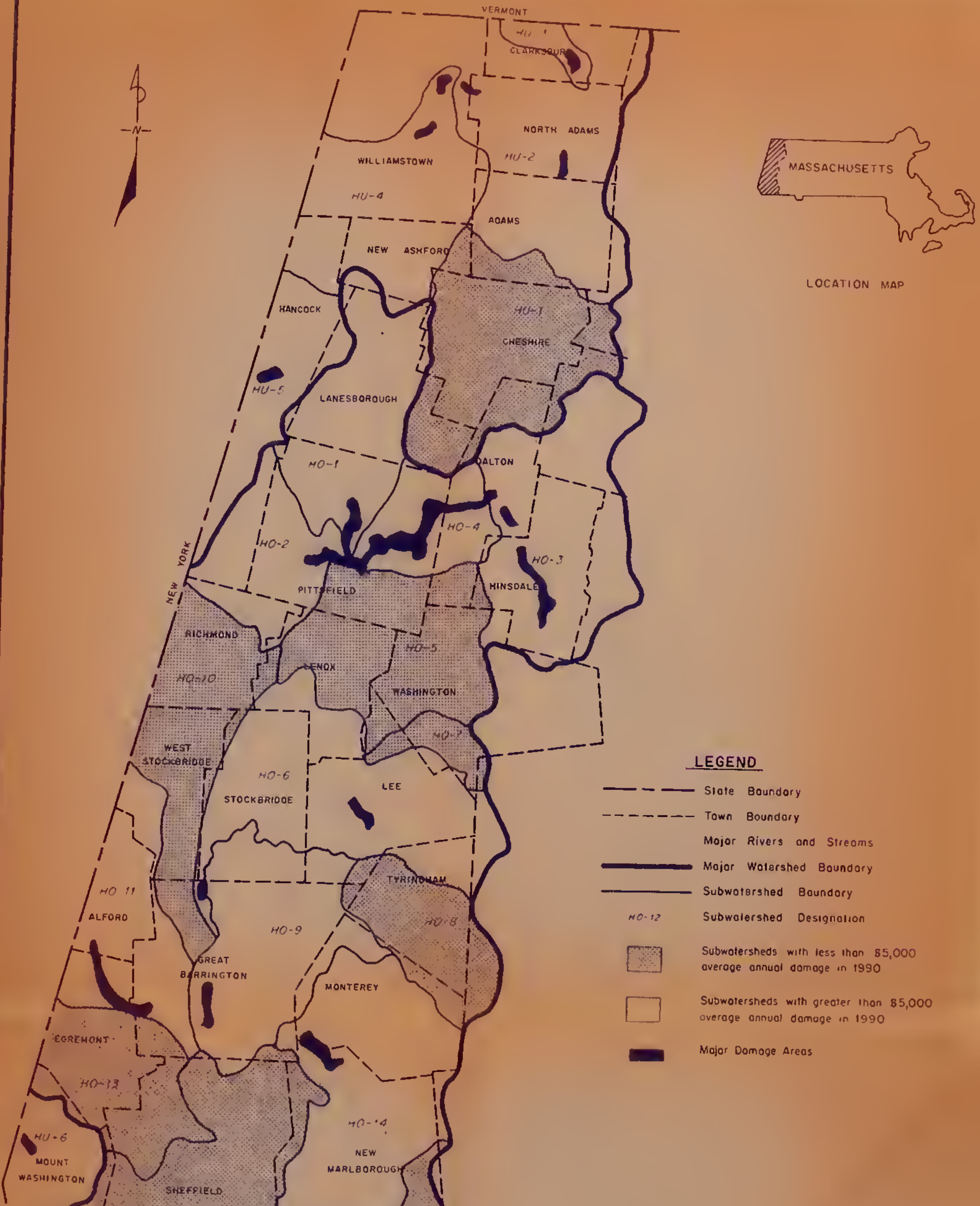

FIGURE 4-2

MAJOR FLOOD DAMAGE AREAS

BERKSHIRE REGION

MASSACHUSETTS

UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

2. contingency measures which require action to be taken to make them effective, such as manually closed sewer valves and removable bulkheads

3. emergency measures carried out during floods according to prior emergency plans, such as sandbagging, pumping, and removal of contents to flood-free areas.

Flood Watch and Warning Systems--The National Weather Service of the National Oceanic and Atmospheric Administration issues warnings of potential flood producing storms. Frequently the flood warnings are preceded by a "severe weather or flood watch."

Local programs can also be implemented to give advance warning to flood prone areas of potential or impending flood danger. On small watersheds with considerable swamp storage, staff gages set at key locations could be monitored by local personnel. Monitoring could be accomplished by the use of float-activated electronic warning signals connected to the police or fire department. All warning systems should be coordinated with local Civil Defense disaster plans.

Three combinations of corrective measures were investigated to illustrate the range of possibilities available to reduce existing flood damage. A summary of the combinations, costs, and remaining damages is presented in Tables 4-2, 4-3, and 4-4. Land treatment floodwater retarding structures, stream improvements, and dikes and floodwalls were considered as one combination. These structural measures have been the traditional basis of federally-financed, flood control projects.

Reduction in flood damage is achieved by reducing runoff and peak flows or by confining flood flows to established channels or floodways. Results of a structural program are presented in Table 4-2.

TABLE 4-2 PROGRAM OF STRUCTURAL MEASURES 1/

Sub-watershed	Cost of Structural Measures	100-year Flood: Remaining Damage 2/	100-year Flood: Damage Reduction	Average Annual 3/: Cost	Average Annual 3/: Benefit	Components of Structural Program: Dams	Channel Modifications	Dikes & Floodwalls	Other Measures
HO-1	165,000	310,000	180,000	10,200	11,100			x	
HO-2	686,000	90,000	2,150,000	42,100	132,000	x			Railroad culvert enlargement.
HO-3	87,000	150,000	320,000	5,300	19,700			x	
HO-4	934,000	290,000	2,850,000	57,300	175,000	x		x	Modify Windsor Reservoir
HO-6	273,000	500,000	1,090,000	16,800	66,900			x	
HO-9	390,000	170,000	320,000	23,900	19,700			x	
HO-11	547,000	40,000	70,000	33,600	4,300	x			
HO-14	962,000	40,000	280,000	59,100	17,200	x			
HU-2	88,000	60,000	70,000	5,400	4,300			x	
HU-3	904,000	10,000	120,000	55,400	7,400	x			
HU-4	2,225,000	80,000	2,540,000	136,600	156,000	x	x		
HU-5	1,204,000	20,000	140,000	74,000	8,600	x			
HU-6	4/	270,000	0	0	0				

1/ Price base - 1975.
2/ Based on projected 1990 damage.
3/ Discount rate 6 1/8%, 100-year evaluation period.
4/ Falls Road damage. Location of damage may vary. More efficient to repair damage as it occurs.

TABLE 4-3 PROGRAM OF FLOODPROOFING 1/

Subwatershed	Floodproofing Cost	100-year Flood Remaining Damage 2/	100-year Flood Damage Reduction	Average Annual 3/ Cost	Average Annual 3/ Benefit
HO-1	45,000	200,000	290,000	3,200	17,800
HO-2	3,000	2,200,000	40,000	300	2,500
HO-3	41,000	150,000	320,000	2,900	19,700
HO-4	64,000	610,000	2,530,000	4,900	155,400
HO-6	35,000	770,000	820,000	1,900	50,400
HO-9	24,000	350,000	140,000	1,200	8,600
HO-11	4,000	80,000	30,000	300	1,800
HO-14	55,000	260,000	60,000	4,800	3,700
HU-2	5,000	110,000	20,000	300	1,200
HU-3	5,000	90,000	40,000	500	2,500
HU-4	18,000	470,000	2,150,000	1,300	132,000
HU-5	4,000	130,000	30,000	300	1,800
HU-6	0 4/	270,000	0	0	0

1/ Price base - 1975.
2/ Based on projected 1990 damage.
3/ Discount rate 6 1/8%, 100-year evaluation period.
4/ Falls Road damage. Location of damage may vary. More efficient to repair damage as it occurs.

TABLE 4-4 PROGRAM COMBINING STRUCTURAL MEASURES & FLOODPROOFING 1/

Subwatershed	Cost of Structural Measures & Floodproofing	100-year Flood: Remaining Damage 2/	100-year Flood: Damage Reduction	Average Annual 3/: Cost	Average Annual 3/: Benefit
HO-1	206,000	180,000	310,000	13,000	19,000
HO-2	688,000	80,000	2,160,000	42,300	133,300
HO-3	110,000	110,000	360,000	6,800	22,000
HO-4	938,000	210,000	2,930,000	57,700	179,900
HO-6	290,000	400,000	1,190,000	18,200	73,100
HO-9	392,000	160,000	330,000	24,200	20,300
HO-11	547,000	40,000	70,000	33,600	4,300
HO-14	962,000	40,000	280,000	59,100	17,200
HU-2	92,000	50,000	80,000	5,700	4,900
HU-3	904,000	10,000	120,000	55,500	7,400
HU-4	2,225,000	80,000	2,540,000	136,600	156,000
HU-5	1,205,000	20,000	140,000	74,000	8,600
HU-6	0 4/	270,000	0	0	0

1/ Price base - 1975.
2/ Based on projected 1990 damage.
3/ Discount rate 6 1/8%, 100-year evaluation period.
4/ Falls Road damage. Location of damage may vary. More efficient to repair damage as it occurs.

Another combination investigated was a floodproofing program to modify existing damageable property. A wide range of techniques was considered to reduce damage at individual locations. Permanent measures, such as the waterproofing of walls were combined with contingency measures such as removable flood barriers to safeguard interior areas from floodwaters. Emergency measures to be carried out during floods, such as pumping and removal of damageable material to flood-free areas were also included in this alternative. Results of the floodproofing combination are summarized in Table 4-3.

A third plan included the same structural measures but combined with floodproofing. Land treatment, floodwater retarding structures, and dikes and floodwalls were used to reduce and control flood flows to manageable levels. Floodproofing measures were then utilized to reduce damage remaining from the reduced flows. Results of this combination are presented in Table 4-4.

A large part of the damageable property in the region is not suited to economical floodproofing. Much of the road and bridge damage can only be reduced by reducing floodflows or enlarging the bridge. In other instances, floodproofing can create a potentially dangerous situation by giving residents a false sense of security. Residents may choose to remain in their floodproofed homes when the more prudent action may be to evacuate to higher ground.

By utilizing floodproofing, in combination with structural measurements, it is often possible to reduce the cost and scope of a structural program while increasing the degree of protection afforded to the area.

Detailed investigations and analyses would be required to establish the most acceptable and effective combination of measures to reduce flood damages in the region. The three combinations considered in this study illustrate a range of possibilities. Final selection of a plan would require significant local inputs, consideration of environmental impacts, and a cooperative effort by local, state, and federal agencies.

Specific alternatives available to reduce flood damage are outlined below:

1. The National Flood Insurance Program--In order to limit flood damage to new development, all communities in the region should cooperate with the National Flood Insurance Program regulations and formulate effective flood plain restrictions such as zoning and subdivision control.

   The towns of New Ashford, Mount Washington, Tyringham, and Washington should submit applications to HUD so that local residents may obtain the benefits of the program.

2. Implement Structural Measures--A program of structural measures is economically feasible in the following subwatersheds:

Subwatershed	Structural Cost	Remaining Damage (from a 100-year flood)
HO-1	165,000	310,000
HO-2	686,000	90,000
HO-3	87,000	150,000
HO-4	934,000	290,000
HO-6	273,000	500,000
HU-4	2,225,000	80,000

3. Implement Floodproofing--A program of floodproofing existing structures is economically feasible in the following subwatersheds:

Subwatershed	Floodproofing Cost	Remaining Damage (from a 100-year flood)
HO-1	45,000	200,000
HO-2	3,000	2,200,000
HO-3	41,000	150,000
HO-4	64,000	610,000
HO-6	35,000	770,000
HO-9	24,000	350,000
HO-11	4,000	140,000
HU-2	5,000	170,000
HU-3	5,000	90,000
HU-4	18,000	470,000
HU-5	4,000	130,000

4. Implement Both Structural Measures and Floodproofing--A program combining structural measures with floodproofing is economically feasible in the following subwatersheds:

Subwatershed	Cost of Structural Measures & Floodproofing	Remaining Damage (from a 100-year flood)
HO-1	206,000	180,000
HO-2	688,000	80,000
HO-3	110,000	110,000
HO-4	938,000	210,000
HO-6	290,000	400,000
HU-4	2,225,000	80,000

USDA Programs

Based on the three sets of alternatives presented, it was apparent that a flood protection project under Public Law 83-566 could be developed in subwatersheds HO-1, 2, 3, 4, and 6 (the Upper Housatonic Watershed). A Watershed Investigation Report has been prepared detailing possible alternatives for watershed development and flood protection. Local sponsorship is a prerequisite for any Public Law 83-566 project. The Berkshire Conservation District, city of Pittsfield, town of Lee, Berkshire County Regional Planning Commission, and the interested public are encouraged to review the Watershed Investigation Report, and to discuss ways that PL-566 can be used to solve local flooding problems.

If sufficient local interest is generated, local units of government are encouraged to submit an application for Public Law 83-566 assistance to the Soil Conservation Service.

In 1971, the Soil Conservation Service completed a Preliminary Investigation Report of the Green River Watershed in New Ashford, Hancock, and Williamstown. The report indicated that a project was feasible under Public Law 566. Local support for development of a Watershed Plan has not been forthcoming. The Berkshire Conservation District, town of Williamstown, and town of New Ashford are encouraged to reconsider potential benefits available from a PL-566 project. A request for detailed planning assistance may be submitted to the Soil Conservation Service.

[illegible]

CHAPTER 5 - EROSION AND SEDIMENT

5.1 SUMMARY

The Berkshire Region is blessed with generally less severe erosion and sedimentation problems than much of the country. However, these problems cannot be discounted entirely. In areas, such as this, most erosion problems stem from agricultural activities and from construction associated with conversion of open or forested lands to urban use.

The following alternatives are proposed for solving the problems which will not be handled under existing programs.

1. With the assistance of the Berkshire County Regional Planning Commission and Berkshire Conservation District, establish and implement erosion and sediment control ordinances in the cities/towns with most potential for urban development. These cities/towns are Pittsfield, North Adams, Adams, Dalton, Great Barrington, Lee, Lenox, Lanesborough and Williamstown.

2. Establish a project measure in the Berkshire-Franklin Resource Conservation and Development project to inventory, map and then stabilize the critical erosion problem areas including the problem streambanks.

3. Establish and maintain stream buffer zones, forest and other permanent vegetative cover, within 50 feet of the region's rivers and streams.

5.2 Resource Base and Existing Programs

Soil erosion results from the action of moving water, wind, gravity, frost or a combination of these forces on the land. In the region, the main concerns are water-activated erosion and its byproduct, sedimentation. In addition, natural or geologic erosion should be differentiated from accelerated erosion.

> "Natural or geologic erosion is a continuing process and will go on into the future regardless of anything man can do. Quickening of the pace of erosion, owing to changes wrought by man, has produced definitely abnormal conditions. Accelerated erosion, an abnormal and undesirable process, was started by man's activities and is subject to his control." 1/

Sheet, rill, gully, stream and roadbank erosion occur in the region, but in general, the erosion rate is low in comparison to the southern or western portions of the country.

Erosion is not only a problem in itself, but also serves as a source for sediment. Once erosion has taken place, the eroded material will usually create a second problem when deposited downstream in stream channels, reservoirs, lakes, wetlands and rivers. Along with the individual soil particles which constitute sediment, any fertilizer, pesticides, animal waste or other organic matter attached to the soil particles, or adjacent, is also carried off. The net result is a lowering of stream water quality.

Erosion and sediment problems have historically been corrected with land treatment measures which are the application of a combination of practices that will meet specific objectives. These objectives include controlling soil erosion, decreasing runoff of rainfall, improving soil and plant productivity, improving wildlife habitat, and improving environmental quality. The practices are classified as management, vegetative and cultural, or mechanical.

Mechanical practices include diversions, terraces, waterways, outlets and small grade stabilization structures. These practices are designed to reduce erosion by reducing the length of slope and by providing proper courses for transporting the water at nonerosive velocities. When used with vegetative practices, mechanical practices can be extremely effective in reducing erosion.

1/North Atlantic Regional Water Resources Coordinating Committee, North Atlantic Regional Water Resources Study, Appendix Q, Erosion and Sedimentation, May 1972, page Q-3.

Examples of vegetative and cultural practices are: conservation cropping systems, cover cropping, contour strip cropping and planting of grasses, legumes, shrubs and trees on critical areas. These practices protect the soil from the impact of raindrops, reduce runoff and reduce the contact between soil particles and flowing water.

Minimum tillage, timber stand improvement, timely field operations, proper grazing use, recreation and wildlife area management, and maintenance operations are all examples of management practices. These practices minimize the overuse of the land while at the same time improve the condition of the cover.

As mentioned, land treatment is planned for other objectives besides erosion control but adequate protection of the soil is of primary importance. Land treatment has been found to be as effective in urban applications as it is in the rural sector.

In addition to land treatment, land use planning and structural measures are also applied to minimize erosion. Land use planning can be developed to guide the use, growth and development of land in the cities and towns. Land subject to excessive erosion can be converted to other land uses which have a lower erosion rate. Areas, such as flood plains and steep slopes, can be managed to reduce erosion and sediment damage.

Structural measures can be designed and used to protect the land from erosion and sediment. Some of the appropriate measures are debris basins, riprapping, channel improvements, and large grade stabilization structures. Erosion and sedimentation can be reduced by decreasing high stream flows with flood control measures. Impoundments and natural storage basins will also collect the sediment in the stream and reduce sediment deposits downstream. The water quality in the stream should also be improved by reducing sediment loads.

Present Conditions

According to the North Atlantic Regional Water Resources Study (NAR), the average erosion rate for the area encompassing the Housatonic River, Area 10, is 0.64 tons/acre/year. The remaining portion of the region is included in the Hudson River, Area 12, for which the NAR estimated erosion rate is 0.86 tons/acre/year.

An analysis of the numerous instantaneous suspended sediment readings taken by the U. S. Geological Survey at the following surface water gaging stations resulted in these estimates:

Station	Drainage Area (Square Miles)	Average Annual Sediment Yield (Tons/Sq. Mile)
HOUSATONIC -		
Green River near Great Barrington	51.	9
HUDSON -		
Dry Brook near Adams	7.5	95
Hoosic River at Adams	46.3	60
North Branch Hoosic River at North Adams	39.	59
Green River at Williamstown	42.6	73
Hoosic River near Williamstown	132.	66

Sediment yield is equivalent to the gross erosion minus what is deposited enroute to the point of measurement. Usually, sediment yield per square mile decreases as the watershed area is increased.

Approximately 6,300 acres of land and 57 miles of streambanks and 6 miles of roadbanks are damaged by erosion within the region. Sediment damages occur on approximately 1,600 acres of land. A breakdown of erosion and sediment damage areas is listed in Table 5-1 and Table 5-2 respectively. The locations of major erosion and sediment damage areas are shown on Figure 5-1.

FIGURE 5.1
SEDIMENT AND EROSION DAMAGE AREAS
BERKSHIRE REGION
MASSACHUSETTS

TABLE 5-1 - EROSION DAMAGE - 1973

Municipality	Acres			Miles[1/]		
	Open Land	Forest Land	Urban Land	Open Land	Forest Land	Urban Land
Housatonic Study Area:	2,289	2,121	713	14.9	8.9	4.7
Alford	80	32	2	0.4	0.3	
Dalton	60	176	14	0.1	0.2	0.1
Egremont	160	42	1	0.3	0.3	
Great Barrington	245	185	25	2.1		0.4
Hancock		5			0.2	
Hinsdale	5	32	13	1.0		0.2
Lanesborough	309	125	43	1.5	1.0	0.5
Lee	175	222	46	0.6	0.5	0.4
Lenox	120	110	25	1.0	1.3	0.3
Monterey	15	30	3		0.4	
New Marlborough	170	202	2	0.7	0.8	
Peru		120	2			
Pittsfield	260	243	474	2.5		2.3
Richmond	10		1	0.2	1.1	0.1
Sheffield	350	110	4	1.7	0.5	0.3
Stockbridge	70	200	45	2.0	0.3	
Tyringham	80	132	1	0.4	0.2	0.1
Washington		120	3			
West Stockbridge	60	35	7	0.4	0.8	
Windsor	120		2		1.0	
Hudson Study Area:	599	530	73	11.3	16.0	7.1
Adams	75	70	20	1.5	2	1
Cheshire	90	60	2	0.5	1	0.3
Clarksburg	14	40	2	1.0	1	0.3
Hancock	32	90	4	2.0	2	0.3
Mount Washington	10	60	4		3	0.5
New Ashford	18	50	1	0.3	1	0.7
North Adams	60	60	25	2.5	3	2
Williamstown	300	100	15	3.5	3	2
REGION TOTAL	2,888	2,651	786	26.2	24.9	11.8

1/Includes mainly road and streambank erosion.

TABLE 5-2 - AREA WITH SEDIMENT DAMAGE - 1973

Municipality	Acres 1/ Open Land	Forest Land	Urban Land
Housatonic Study Area:	443	238	350
Alford	10	2	2
Dalton	6	10	20
Egremont	16	6	1
Great Barrington	40	25	22
Hancock		2	
Hinsdale	3	2	4
Lanesborough	36	14	41
Lee	18	22	53
Lenox	6	3	3
Monterey	2	4	2
New Marlborough	40	37	2
Peru		3	1
Pittsfield	50	25	191
Richmond	2	2	1
Sheffield	145	22	4
Stockbridge	7	20	11
Tyringham	35	20	1
Washington		12	
West Stockbridge	7	6	1
Windsor	20	1	
Hudson Study Area:	276	281	44
Adams	50	40	12
Cheshire	56	35	2
Clarksburg	10	20	2
Hancock	23	40	2
Mount Washington	7	40	3
New Ashford	9	31	1
North Adams	41	35	12
Williamstown	80	40	10
REGION TOTAL	719	519	394

1/Acreage includes sediment damage in streams.

Gross erosion from forestland is nominal, 0.4 ton/acre/year; however, there are approximately 325 miles of improperly maintained logging-roads and skidtrails that are contributing excessive sediment to the streams.

The following are examples of typical erosion and sediment problems found in the region.

Much streambank erosion and resultant sedimentation is occurring where the Housatonic River channel is meandering through the towns of Sheffield and Great Barrington. Changes in the stream course occur during high water and are noticeable when the river has receded. During high flows the streambanks erode and sediment is deposited in the channel and on the flood plains. The flood plains along the Housatonic River are currently used for agricultural purposes. Consequently, streambank erosion is reducing the amount of usable agricultural land in these flood plains. Sediment deposits on the flood plains may increase the fertility of agricultural land, but large amounts of infertile overwash usually impair their agricultural use.

In Pittsfield, the sediment and erosion damages mainly occur on urban land. Streambank erosion occurs along the Housatonic River in this area. Erosion of roadbanks, construction sites and other disturbed areas is evident. Sedimentation damage areas consist of roads, roadside ditches, construction sites, new home sites, gravel pits, catch basins, culverts, sewer lines, golf courses, etc.

In Dalton, sediment is being deposited in the upper portion of Center Pond and is reducing its storage capacity. During the past year the sediment has created islands within the pond. The source of sediment is erosion in the upstream reaches of the East Branch of the Housatonic River.

Erosion and sediment damages occur along the Green River and the lower part of the Hoosic River in Williamstown. Damages consist of erosion on agricultural land, road and streambank erosion, sediment deposits in channels and on flood plains, and stream course changes. Sediment is being deposited under highway bridges crossing the Green and Hoosic Rivers. The latter river has changed its course in various places as a result of streambank erosion and channel sedimentation.

Heavy rains during the summer of 1973 caused extensive damage to the lower part of the study area. In Mount Washington, high flows in Bash-bish and Wright Brooks caused severe road and streambank erosion. Parts of Falls Road, where it parallels these streams, were washed out. Other roads within the town also sustained erosion damage.

Existing Programs

Landowners and communities are assisted in their efforts to control erosion and sediment and in other conservation efforts by the Berkshire Conservation District. The district coordinates assistance from the Soil Conservation Service, the Extension Service, the Massachusetts Division of Forests and Parks in cooperation with the U.S. Forest Service for forestlands, and from other state and federal agencies.

Within the region, there are 520 district cooperators, controlling 77,700 acres of land. Approximately 60 percent of the cooperators (320 with 48,300 acres of land) have conservation plans, which are overall soil and water management plans for their land. The land owned or occupied by cooperators includes agricultural land, forest-land, recreation land, and wildlife land.

The Massachusetts Department of Environmental Management and the Massachusetts Department of Fisheries, Wildlife and Recreational Vehicles are applying multiple-use management to approximately 67,200 acres of forestland under their jurisdiction. 1/ About 25 percent of the private nonindustrial forest landowners, involving about 62,000 acres, are participating in the

1/ As authorized under General Law 132, Section 31, and General Law 131, Section 6.

Cooperative Federal-State Forest Management Program. Tree farms have been established on 7,500 acres of this area. Most of the public and private watershed wildlife areas, recreational sites, and forest industry lands are under some degree of regulatory management. Approximately 50 percent of the forestland in the study area is under some form of management (see Figure 3-3).

The Agricultural Stabilization and Conservation Service administers several United States Department of Agriculture programs. One of these, The Agricultural Conservation Program (ACP), provides cost sharing assistance to farmers and other landowners who undertake soil, water, forest and wildlife conservation practices. The cost for such practices is shared between the federal government and the landowner. Technical assistance for ACP practices is rendered by the Soil Conservation Service, the Extension Service, and the U.S. Forest Service in cooperation with the Massachusetts Division of Forests and Parks.

The Watershed Protection and Flood Prevention Act (Public Law 83-566) authorizes the Secretary of Agriculture to give technical and financial help to local organizations in planning and carrying out watershed projects. These projects include land treatment practices for reduction of erosion and sedimentation along with other measures, such as flood prevention, structural and nonstructural measures, recreation, and water supply. Two projects, the Washington Mountain Brook Watershed and the Blackberry River Watershed, have been authorized for installation. The Blackberry River Watershed project, approximately 11.9 square miles in Massachusetts and 34.3 square miles in Connecticut, has been completed. Management plans have been prepared for approximately 10,600 acres within these two watersheds. In addition, other land treatment measures, including 33.5 miles of skid and logroad erosion control and 4,100 trees planted on seven acres, have been installed. The multipurpose structures planned will also contribute to reduction of sediment damage downstream.

In 1970, the Berkshire-Franklin Resource Conservation and Development Project, (RC&D) was authorized for operations. The project area includes all of Berkshire and Franklin Counties. The Soil Conservation Service has leadership for the United States Department of Agriculture (USDA) in the RC&D program. Resource Conservation and Development programs expand opportunities for conservation districts, local units of government, and individuals to improve their communities in multicounty areas through prudent use, management and protection of natural resources.

Within the RC&D project area, the Soil Conservation Service may use RC&D funds to provide the sponsors with both technical and financial assistance for carrying out certain RC&D measures having community benefits. These measures are: (1) critical area treatment (erosion and sediment control) (2) flood prevention (3) public water-based recreation developments (4) public water-based fish and wildlife developments (5) farm irrigation (6) land drainage (7) soil and water management for agricultural related pollutant control (8) rural community water supply (9) systems for water quality management (10) systems for the disposal of solid wastes and (11) storage of water for rural fire protection.

The following measures are planned or are being considered for the region. These measures include Critical Area Treatment (CAT) and combined measures for the purpose of erosion and sediment control.

Town/City	Measures	Remarks
West Stockbridge Richmond	Tornado-Stricken Area CAT	Stabilization of streambanks, roadbanks, and other disturbed areas resulting from a tornado in August 1973.
Mount Washington	Bashbish CAT	Stabilization of streambank.
Lanesborough	Bridge Road CAT	Stabilization of gully erosion along roadway.
Tyringham	Tyringham Flood Prevention and Drainage	Includes gully stabilization and waterway construction.
Adams, North Adams	Hoosic River Flood Prevention	Riverbank stabilization.

In the RC&D project area, but outside of the region, five CAT's or land stabilization measures have been installed to date. Within the region, the Wild Acres Reservation Improvement (Pittsfield), a public water-based multipurpose fish, wildlife and recreation development adjacent to Pittsfield Airport, included land stabilization and waterway construction to correct a serious erosion problem.

5.3 Problems and Objectives

The sediment and erosion objective is to reduce sedimentation and erosion rates to acceptable levels by eliminating accelerated erosion.

The region is not considered a major erosion or sediment problem area. The soils in general have low erodibility potential and the region is approximately 70 percent forested. However, there are erosion problems stemming from:

1. cropland without adequate land treatment
2. poor timber production practices
3. areas undergoing urban development (construction sites)
4. streambanks and other critical areas (sources of sediment, gullies, unstable slopes, abandoned gravel pits and other unvegetated areas).

Sedimentation can be reduced to natural geologic levels by reducing erosion to acceptable levels. With an adequate program of erosion control, additional sediment problems in the future will be minimized. They cannot, practically speaking, be entirely eliminated as there are many situations where natural geologic rates of sedimentation will create problems. Mill dams or ponds with small storage volumes in proportion to their watershed size will continue to fill with sediment.

5.4 Needs

It is necessary to consider which erosion and sediment problems listed will be corrected by existing programs. Alternatives are presented in the next section for problems which will not be adequately corrected by existing programs.

1. Cropland without adequate land treatment.

It is expected that the ongoing program of the Berkshire Conservation District along with the cost sharing assistance available to operators through the Agricultural Conservation Program of the Agricultural Stabilization and Conservation Service will be sufficient or provide adequate land treatment to cropland. In addition, land treatment needed to reduce erosion on pasture, forest and other (nonurban) lands, can be provided through the same means. Table 5-4 - NEEDED LAND TREATMENT MEASURES, lists current needs for land treatment, including measures where the primary objective is not erosion control.

TABLE 5-3 - NEEDED LAND TREATMENT MEASURES

Practice	Unit	Amount Needed	Cost ($1,000)
Agricultural Measures:[1/]			
Conservation cropping system	acres	3,840	350
Hay and pasture planting	acres	4,000	720
Critical area planting	acres	700	1,050
Ponds	number	280	620
Drainage, tile and open ditch	feet	100,400	100
Wildlife upland habitat management	acres	23,800	3,970
Wildlife wetland habitat management	acres	6,800	1,700
Forestry Measures:[2/]			
Tree planting	acres	12,000	900
Forest stand improvement	acres	206,000	8,240
Managed commercial cuttings	acres	1,600	20
Logroad and skidtrail erosion control	miles	325	30
Multiple-use management	acres	197,000	990
TOTAL COST ($1,000)			18,590

2. Poor timber production practices.

The erosion and sediment problems associated with forestlands can be reduced by greater implementation of the ongoing assistance programs. There is a need for greater utilization of these forestry assistance programs in the region. This need is addressed in CHAPTER 3 - LAND USE.

For forestland, land management and treatment measures can be applied through cooperative federal, state, and local efforts. One objective is to protect and improve watershed conditions that will control surface runoff, thereby reducing excessive erosion and sedimentation. Effective measures include forest fire protection, planting on exposed soils, skid and logroad stabilization, streambank stabilization, and urban forestry.

Winter logging should be encouraged, where protection of other land values is critical since disturbance to the forest floor is less likely to occur during this time of year when the soil is frozen.

1/SOURCE: These data were developed in 1973 by the Soil Conservation Service field office staff at Pittsfield, Massachusetts.

2/SOURCE: <u>Massachusetts Soil and Water Conservation Needs Inventory</u>, Massachusetts Division of Forests and Parks, 1971.

Basic safeguards to follow with regard to logging roads and skidtrails are:[1/]

1. Locate roads and trails at least 50 feet from stream courses except where a stream crossing cannot be avoided. Increase distance by 4 feet for each 1 percent increase in slope.
2. Keep logging operations away from streams. The cutting limit is 25 feet plus 2 feet for each 1 percent slope of land.
3. Truckroads should cross all water courses on culverts or bridges at right angles to the stream. Temporary culverts or bridges should be used where heavily used skidroads cross streams.
4. Maximum grade on truckroads and heavily used skidtrails should be less than 10 percent. Increase in grade is permissible only for short distances.
5. Roads should be adequately cross drained. Interval between drains equals 1,000 feet divided by the percent grade.
6. Build roads and skidtrails in dry weather if possible.
7. The shorter the logging period, the less likelihood for erosion.
8. After the logging job, remove temporary bridges and opentop culverts and seed disturbed areas with grasses.
9. Install water bars on all logging roads closed to vehicle traffic after logging.
10. Close supervision is required to insure the safeguard of water quality.

The remaining problems require solutions which are not adequately provided by existing programs.

3. Areas undergoing urban development (construction sites).

From 1952 to 1972, approximately 750 acres of open or forested land were converted to urban use per year in the region. During the construction period, soils are usually stripped of vegetative cover and are often left in this exposed condition for extended periods of time. The result can be severe erosion on the site and quantities of sediment released downstream. It is expected that 1,000 acres per year will be converted to urban use by 1990.

1/Established under The Forest Cutting Practices, General Law, Chapter 132, Sections 40-45, as amended, deal briefly with logging road location. Many timber removals are exempted from this Act.

Provisions should be made for the retention of optimum amounts of vegetative cover for watershed protection on all areas undergoing residential, highway, and industrial development and construction. Developers should prepare and follow plans designed to minimize the deterioration of the hydrologic balance and the resulting erosion by maintenance of vegetative cover during development. They should utilize the natural landscape in their planning for environmental purposes. Where necessary, developers and contractors should apply erosion control measures, such as temporary debris basins or desilting basins, seed and mulch exposed areas, create temporary diversions, and retain forest buffer zones during construction. Adequate planning prior to construction and close supervision of construction operations are needed to control this sediment source.

4. Streambanks and other critical areas.

Many of the 6,300-acres of land with erosion problems, mentioned earlier, will have these problems eliminated under present land treatment programs. In addition, many acres will be stabilized through natural plant succession or by the soil protection measures; grass, asphalt paving, etc.; associated with urban development. But for the approximately 750 acres of critical areas and 57 miles of streambanks which will not be stabilized under ongoing programs, something additional is needed. In addition, it is to be expected that more critical erosion areas will develop in the future.

5.5 Alternatives

To control erosion and its byproduct sediment from construction sites, the following alternative is presented:

1. Establish erosion and sediment control ordinances in municipalities with the most potential for urban development, (Pittsfield, North Adams, Adams, Dalton, Great Barrington, Lee, Lenox, Lanesborough, Williamstown) with assistance from the Berkshire County Regional Planning Commission and Berkshire Conservation District.[1/]

1/Towns can also use the authority granted to them under General Law, Chapter 40, Section 21, Clause 17 for earth removal control.

These ordinances could be additions to present zoning, subdivision regulations and/or building regulations. A recent publication, Guidelines for Soil and Water Conservation in Urbanizing Areas of Massachusetts, (April 1975) by the Soil Conservation Service, contains much useful information on controlling erosion and sediment, for local officials and others. For federal and/or state construction, there are both state and federal regulations which are designed to minimize erosion and sediment on federal and/or state financed projects.

For the 750-acres of critical erosion areas, the 57-miles of problem streambank and the critical areas expected to develop in the future, the following alternatives are presented:

2. Establish a project measure in the Berkshire-Franklin RC&D Project to:
   - inventory and map all critical erosion areas and problem streambanks--this inventory to be repeated periodically at 3-5 year intervals
   - stabilize these problem areas with technical and financial assistance.

3. Establish and maintain stream buffer zones, forest and other permanent vegetative cover, within 50 feet of the region's rivers and streams. 1/

This is an especially appropriate land treatment practice for the Housatonic River in the towns of Great Barrington and Sheffield where streambank erosion has been a serious problem for many years. In many cases, this practice will not completely stabilize the streambanks and structural means, such as riprap may be necessary to protect development, such as roads. These vegetative means, if not completely successful in stabilizing streambanks, will reduce the problem significantly.

1/General Law, Chapter 48, Section 16, as amended by Chapter 108 of the Acts of 1973, Fire Laws, requires a twenty-five foot strip free of slash from forest cuttings adjacent to streams and ponds.

CHAPTER 6 - WETLANDS

6.1 SUMMARY

The 21,800-acres of inland wetlands in the region provide many benefits: flood control, wildlife habitat, open space, and water quality protection. The ongoing wetlands programs, including Massachusetts pioneer wetlands legislation, will go far in protecting wetlands from harmful alteration. Further measures are presented in Section 6.5, Alternatives, for preservation and use of wetlands.

6.2 Resource Base and Existing Programs

General

Wetlands are those areas where the water table is at or near the ground surface for much of the year and are subject to occasional flooding. In the region, wetlands include swamps, marshes, bogs, beaver ponds, seasonally flooded flats and wet meadows. The soils of the wetlands are usually poorly or very poorly drained except for beaver ponds and seasonally flooded flats. The latter are usually alluvial or flood plain soils which have better drainage.

See Table 6-1, Acres of Inland Wetlands, for wetland acreage of the region's municipalities. The wetland figures in this chapter do not include open water, but wooded swamps have been included. Also, these figures do not include flood plain lands that are dry most of the time, although these usually dry portions of flood plains are in the same jurisdictional category as wetlands in Massachusetts wetland legislation (General Laws, Chapter 131, Section 40 and General Laws, Chapter 131, Section 40A).
The approximate 21,800 acres of inland wetlands in the region represents five percent of the total area. The range is from 0.3 to 12.6 percent for individual cities or towns.

Wetlands are important for flood control, wildlife habitat and to a lesser degree for water quality and groundwater aquifer protection. In addition, wetlands are extremely poor sites for industrial, commercial, and residential development because of high water tables, the flooding hazard and the possibility of organic materials in the soils underlying

TABLE 6-1 - AREA OF INLAND WETLANDS

Municipality	Open Type Wetland Acres1/,2/	Wooded Swamps Acres3/	Total Acres	Wetlands as Percent of Municipality	Water Area Acres1/
Housatonic Study Area	10,747	9,803	20,550	6.6	6,089
Alford	32	56	88	1.2	0
Dalton	106	56	162	1.2	41
Egremont	223	73	296	2.4	97
Great Barrington4/	818	1,492	2,310	7.9	307
Hinsdale	492	887	1,379	10.0	503
Lanesborough	388	169	557	2.9	453
Lee4/	693	443	1,136	6.5	415
Lenox4/	728	813	1,541	11.1	85
Monterey	661	148	809	4.5	605
New Marlborough	1,226	395	1,621	5.4	528
Pittsfield	1,196	746	1,942	7.2	1,168
Richmond	564	227	791	6.5	200
Sheffield	993	2,631	3,624	11.5	727
Stockbridge4/	687	1,205	1,892	12.6	478
Tyringham	701	34	735	6.3	117
Washington	664	321	985	4.0	310
West Stockbridge	575	107	682	5.7	55
Hudson Study Area	810	481	1,291	1.0	906
Adams	15	28	43	0.3	38
Cheshire	235	101	336	1.9	424
Clarksburg	110	18	128	1.6	49
Hancock	253	20	273	1.2	29
Mt. Washington	29	259	286	2.0	94
New Ashford	40	0	40	0.5	0
North Adams	50	50	100	0.7	171
Williamstown	78	7	85	0.3	101
Total	11,557	10,284	21,841	5.0	6,995

1/ Data obtained from Massachusetts Map Down Project at University of Massachusetts, directed by Prof. William P. MacConnell; except for data for towns of Great Barrington, Lee, Lenox and Stockbridge.

2/ These open type wetlands, as mapped by MacConnell et al., are based on the wetlands classification presented in Wetlands of the United States, Circular 39, U.S. Department of The Interior, Fish and Wildlife Service. The Massachusetts Map Down wetland types included in the open type wetlands column above and the equivalent wetland type of the U.S. Fish and Wildlife Service, Circular 39, are as follows: Seasonally flooded basins or flats--Type 1; Bog--Type 8; Shrub Swamp--Type 6; Meadow--Type 2; Shallow Marsh--Type 3; Deep Marsh--Type 4; Beaver Pond--Type 3 or 4.

3/ Measured by the Soil Conservation Service; except for Great Barrington, Lee, Lenox and Stockbridge data. This is equivalent of Type 7, Circular 39.

4/ From Report on the Housatonic River Flood Plain and the Inland Wetlands in the town of Great Barrington, and similar reports for Lee, Lenox and Stockbridge; prepared by Robert G. Brown and Associates, Inc., 1974.

the foundation. High water tables eliminate the use of septic tank and leach field systems for onsite sewage disposal, create serious site drainage problems and make the use of building basements impractical and often impossible. The presence of organic material, muck or peat, in a foundation often results in differential settlement and cracking of the structure or fill. Removal of mucks and peats, particularly deep deposits, is usually a necessity for all but the lightest of fills or structures.

Wetlands act as natural floodwater retarding basins which store floodwaters and, thus, lower downstream peak flood flows. Loss of these storage areas result in higher flood peaks and more extensive flooding downstream.

Many wildlife species depend directly on wetlands for food and habitat. As a result, wetlands provide many opportunities for recreational activities such as hunting and wildlife observation.

Stream water quality can be either adversely or advantageously modified by wetlands. An example of adverse modifications can occur when wetland aquatic plants, including algae, die and decay. During this decomposition, dissolved oxygen (DO) can be lowered to inadequate levels to sustain fish and other aquatic animal life. Often, this situation is triggered by nutrient loadings from upstream domestic or industrial waste effluents. Wetlands can also enhance water quality by acting as sediment traps and nutrient filters. The quality of the incoming water and the condition of the wetland must be known to determine how a particular wetland will effect water quality.

In the region, the major groundwater aquifers are usually in the bottom lands or flood plains along or near the major streams. These aquifers are often surfaced by wetlands. A measure of protection to underlying aquifers can be provided by maintaining these wetlands.

Most inland wetlands, during normal or dry periods, act as areas of groundwater discharge. During times of flood, however, there is the

possibility of recharge into groundwater storage areas through their wetlands cover. Also the storing of floodwater in upland wetlands and the releasing of lower flows for a longer period of time from them may allow advantageous recharge conditions to develop downstream.1/

Important Wetlands

All wetlands are capable of floodwater storage but the size and location within a watershed determines how effective an individual wetland will be in modifying downstream flood flows. A larger wetland has more capacity to store floodwater and thereby produce lower peak flows than a similar but smaller one would. In general, the wetlands further downstream will be more effective because of the larger drainage areas they control. However, the relative timing of contributing areas, within a watershed, needs to be considered.

Rating wetlands for wildlife is a very complicated process. The U. S. Fish and Wildlife Service in the Southeastern New England Water and Related Land Resources Study used the following characteristics to rate wetlands: size, type, vulnerability, waterfowl value, other wildlife value and management potential. In general, shallow and deep marshes are the most important for waterfowl.2/

Regionally important wetlands are shown on Figure 6-1 and their approximate acreage and other information are listed in Table 6-2. These important wetlands should be protected from urban development or other alternations.

Existing Programs

State Programs

The Hatch Act, passed by the Massachusetts General Court in 1965, attempted to control the alteration of the wetlands. This act has been modified several times by the General Court. The comparable legislation in force today is Chapter 131, Section 40, of the General Laws as amended by

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1/Holzer, Thomas L., "Inland Wetlands and Ground Water in Eastern Connecticut," Proceedings: Wetlands Conference, June 20, 1973 at Storrs, Connecticut, Report No. 21, Institute of Water Resources, University of Connecticut, December 1973.

2/Oliver, Thomas and David Ferguson, "Inland Wetlands Management, Taunton Basin," Preliminary Single-Purpose Plan Report, Southeastern New England Water and Related Land Resources Study, 1973.

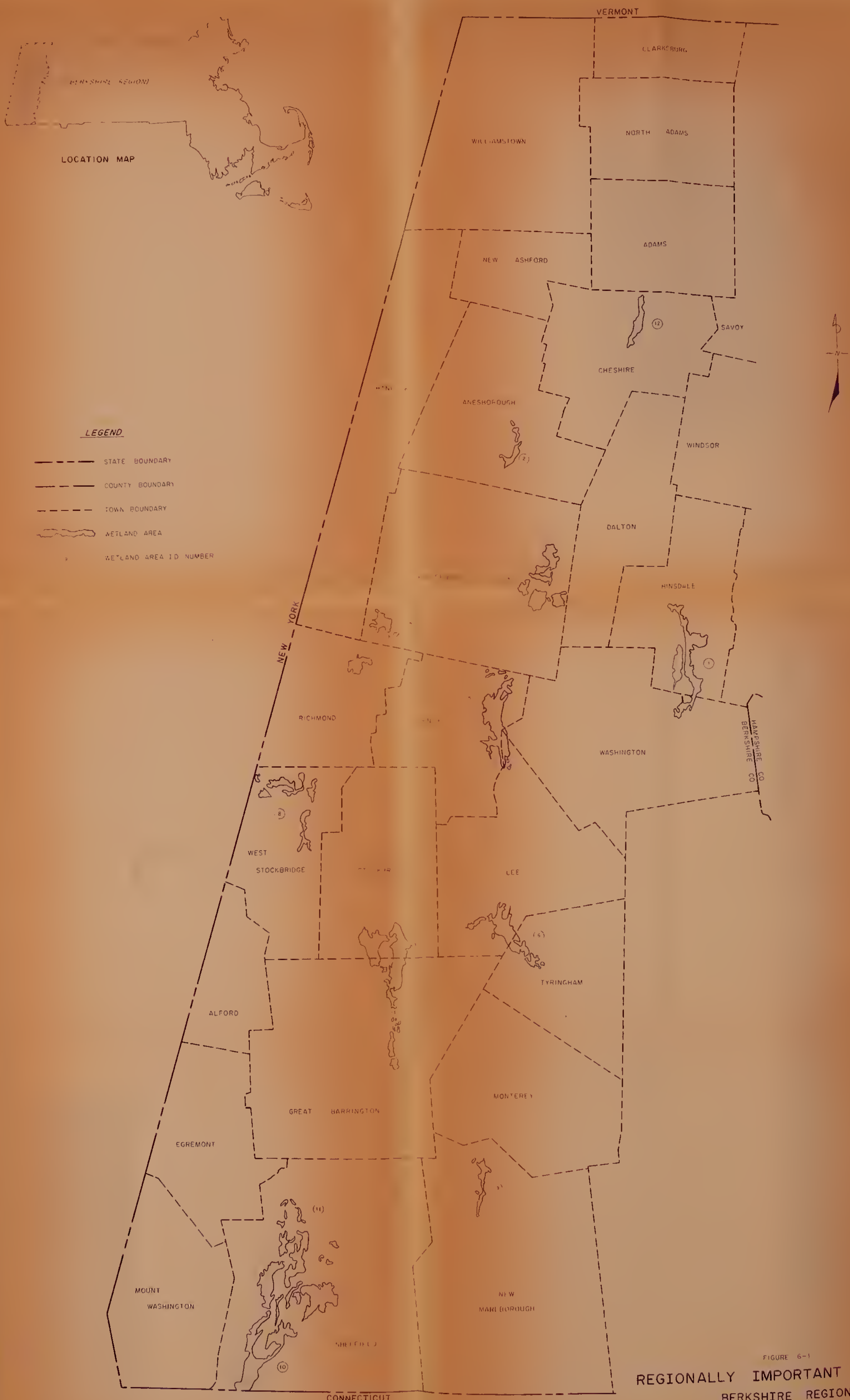


FIGURE 6-1

REGIONALLY IMPORTANT WETLANDS

BERKSHIRE REGION

MASSACHUSETTS

UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

Chapter 818 of the Acts of 1974 and Chapter 363 and 334 of the Acts of 1975. In addition, the commissioner of the Massachusetts Department of Environmental Quality Engineering (DEQ) has established a set of regulations, as authorized, to assist those regulating the Act.

The Act is administered by town or city conservation commissions or the city mayor or town selectmen in communities without conservation commissions. Appeals from local decisions go first to the Massachusetts Department of Environmental Quality Engineering and, if still unresolved at this level, the courts become the final arbitrators.

This Act, often called the Wetlands Protection Act, is only a partial solution to the problem of wetlands protection. The Inland Wetlands Restriction Act (Chapter 131, Section 40A of the General Laws) allows the Massachusetts Department of Environmental Management to place restrictions on the use of inland wetlands. The Act allows the commissioner of DEM to regulate, restrict, or prohibit dredging, filling, removing or otherwise altering or polluting inland wetlands.1/ Restrictions under this Act have been imposed on several towns, largely in the Charles River, Neponset River and Barnstable County areas. To reach this final stage, inland wetlands have to be mapped, and all assessed owners of land within these designated wetlands, must be notified. A public hearing is then held in the community or watershed area. After the public hearing, the town selectmen or city council have to approve the restriction orders in their community. If the community officials fail to approve, the commissioner may override their decision after a six-month waiting period. Redress for unsatisfied landowners is through the courts.

Massachusetts state agencies and, in particular, the Division of Forests and Parks, and the Division of Fisheries and Wildlife have active land acquisition programs. In addition, the Division of Fisheries and Wildlife

1/General Law, Chapter 131, Section 40A, as amended by Chapter 782 of the Acts of 1972.

has given emphasis to wetlands acquisition. The Housatonic Valley Wildlife Management Area, owned by the Massachusetts Division of Fisheries and Wildlife, includes approximately 330 acres of the wetlands upstream of Woods Pond on the Housatonic River in Lenox. This wetland area is one of the most significant wildlife wetland areas in the region.

Municipal Programs

Many communities in the region have embarked on conservation area plans which attempt to preserve and enhance the natural resources, and especially the water resources, within the community. Usually this effort is spearheaded by city or town conservation commissions. Cheshire and Clarksburg are the only towns in the region that do not have conservation commissions at this time.

Federal and state cost sharing funds are available to the cities and towns for use in purchasing conservation, open space and recreation areas. The Division of Conservation Services administers the Massachusetts Self-Help Act (General Law, Chapter 40, Section 8C) and administers or coordinates the Land and Water Conservation Program of the Bureau of Outdoor Recreation, the U. S. Department of The Interior, within Massachusetts.

In addition to acquisition programs, communities can adopt flood plain zoning ordinances to regulate the use of their wetlands and flood-prone areas. See Chapter 4, Flooding, for more detail on this project.

Quasi-public Programs

The Housatonic River Watershed Association, Berkshire Natural Resources Council, Berkshire County Land Trust and Conservation Fund, Massachusetts Audubon Society, Trustees of Reservations and other similar organizations assist individuals and municipalities in protecting the region's wetlands and other natural resources. These groups engage in various activities including environmental education; acquisition of wetlands, flood plain and other important natural resource areas; wildlife sanctuary and reservation management; and assistance to the region's cities and towns in their respective wetland and other resource programs.

6.3 Problems and Objectives

With all the land available for urban development in the region, there is still pressure to develop wetland sites for urban uses. To do so would be to sacrifice the public benefits of flood storage, wildlife habitat and other values of wetlands in exchange for the excess costs inherent in construction on high water tables, and flooding hazards associated with location in a wetland.

The major objective for the region's wetlands is to preserve wetland characteristics so that they can perform their useful functions.

In the past, the use of wetlands which yielded the highest "economic" return was to develop them for urban use. This usually resulted in the destruction of those wetlands. A secondary objective is, therefore, to develop economic uses of wetlands which are compatible with wetland capabilities. An example would be the management of wooded swamps for timber products. Wetlands comprise one of the most vital natural resources of the region. There is an opportunity here to enhance environmental quality by the preservation of regionally important wetlands. Another secondary objective would, therefore, be to take advantage of this opportunity and thereby increase the public recreational and educational resources of the region.

6.4 Needs

For the period, present to 1990, the ongoing program will include:

1. Regulation of development of wetlands by town/city officials under the Wetlands Protection Act, General Laws, Chapter 131, Section 40.
2. Flood plain zoning, the HUD Flood Insurance Program, and other flood management programs are being established in the region. As of January 1, 1976, all but four towns in the region were in the Flood Insurance Program. A substantial portion of the region's wetlands are on the larger streams and rivers, and would, therefore, be included in these flood plain management programs.

MASSACHUSETTS WATER RESOURCES STUDY - BERKSHIRE REGION

TABLE 6-2 - REGIONALLY IMPORTANT WETLANDS

Wetland	Location Town/City	Approximate Size Acres	Semi-Public & Public Ownership Acres	Important for: Flood Control	Wildlife1/	Groundwater Protection2/	Overlies Major Aquifer2/	Urban Encroachment
1. East Branch Housatonic	Hinsdale, Washington	880	0	x	-	x	x	-
2. Town Brook	Lanesborough	170	5	x	-	x	x	Yes
3. Brattle Brook and adjacent Housatonic R.	Pittsfield	680	110	x	-	x	-	Yes
4. Southwest Branch around Richmond Pond	Pittsfield, Richmond	380	10	x	x	x	-	-
5. Woods Pond	Lee, Lenox	920	470	x	x	x	-	Yes
6. Hop Brook & Housatonic River	Lee, Tyringham	540	0	x	x	x	-	-
7. Agawam & Konkapot Brooks	Stockbridge, Great Barrington	1,250	130	x	x	x	-	-
8. Flat Brook & Williams Rivers	W. Stockbridge	540	0	x	x	x	x	Yes
9. Konkapot River	N. Marlborough	160	0	x	-	x	x	-
10. Schenob Brook	Sheffield	1,620	0	x	x	x	-	-
11. Hubbard Brook	Sheffield	690	0	x	x	x	-	-
12. Hoosic River	Cheshire	230	35	x	x	x	x	-
TOTALS		8,060	760	12	8	12	5	4
PERCENT		100.	9.					

1/ Interpreted on intermix which includes DM & SM types.
2/ Groundwater interpretation based on USGS publications.

3. The Inland Wetlands Restriction Act (General Laws, Chapter 131, Section 40A) has been applied in the eastern part of Massachusetts. Implementation of this act in the region may be several years away.
4. Acquisition of wetlands by cities and towns, state agencies and quasi-public organizations. Approximately a third of the region's communities have received cost sharing funds for such acquisition from either the federal or state programs mentioned in Section 6.2. Future acquisition, by 1990, under present programs would be approximately 1,200 acres of wetlands based on recent acquisition trends.

Existing legislation and programs offer the tools to solve many of the wetlands problems of the region. In addition to these ongoing programs, the following are necessary:

1. Delineate the wetlands and present this information on large scale maps. This would be the first step in the preservation of wetlands because it would quantify and locate the resource.
2. Coordinate state, regional, municipal and quasi-public (Berkshire Natural Resources Council, Massachusetts Audubon Society, Housatonic River Watershed Association, etc.) wetland protection activities.
3. For both public and privately held wetlands, uses that are compatible with wetland capabilities and functions should be identified and promoted. An example would be the encouragement of forestry practices in wooded swamps. There is a need to employ forestry practices as a means of improving wildlife habitat, (see Chapter 9). Through selective timber harvest, associated hazard removal and access development, many of these areas could also serve the recreation needs of the surrounding communities.
4. With only nine percent of the approximately 8,000 acres of regionally important wetlands in public or quasi-public ownership, there is both an opportunity and a need to increase public ownership of these regionally important wetlands and utilize them to meet the regional and educational needs of the general public.

6.5 Alternatives

To preserve wetland characteristics and to promote economic, recreational and educational uses, the following alternatives are presented:

1. Delineate the region's wetlands on large scale maps. Four towns: Lee, Lenox, Stockbridge and Great Barrington, have satisfactory wetland delineations.
2. A regional wetlands protection organization with representatives from the Berkshire County Regional Planning Commission, municipalities, state agencies, and quasi-public groups, such as the Housatonic River Watershed Association, Berkshire Natural Resources Council and the Massachusetts Audubon Society should coordinate the protection, acquisition and management efforts for the region's wetlands. This group should promote economic uses for wetlands which are compatible with wetland capabilities.
3. An accelerated acquisition program to acquire an additional 2,000 acres (an additional 1,200 acres are expected to be acquired under ongoing programs) by 1990, within the regionally important wetlands. This acquisition would help preserve wetlands and also help meet the recreational, educational and wildlife needs of the region.

CHAPTER 7 - WATER QUALITY

7.1 SUMMARY

Water Quality programs appear to be on the verge of reestablishing high water quality in the Berkshire Region. Federal, state, and local government efforts have resulted in the planning and construction of numerous waste-water treatment facilities to provide at least secondary treatment for major point sources of pollution. Construction is underway on two regional systems - the Pittsfield system which will treat wastes from neighboring towns and industries, and the Hoosac Water Quality District serving North Adams, Williamstown, and Clarksburg. Industries in the region are also moving to adequately treat their wastes. Some companies are installing their own facilities while others have opted to cooperate in the expansion of municipal plants to process industrial waste.

New construction and improvements to existing treatment plants are expected to reduce point pollution enough to enable the region to meet water quality standards by 1977.

As treatment of point sources is upgraded, the magnitude of nonpoint pollution is expected to become more apparent. Inadequately treated effluent from individual septic tank systems has been recognized as an important problem area.

Soil conditions in much of the region are unsuitable for septic tank systems. Seasonally high water table, bedrock or hardpan, and low permeability are the most common limitations on the use of individual disposal systems. The use of septic tank systems by second home and recreation developments around ponds and lakes has increased the eutrophication rate by the addition of nitrates and phosphates.

Agricultural pollution from animal wastes, pesticides, herbicides, and fertilizers is another potential problem area.

In order to achieve and maintain high water quality in the region, it will be imperative to insure adequate treatment from point sources and adequate management on nonpoint sources of pollution. A continuing monitoring program will be needed to insure that municipal and industrial treatment plants are operating efficiently.

Nonpoint pollution sources need to be evaluated to determine their magnitude and effect on water quality.

Local communities need to place more emphasis on soils limitations when planning for growth. Soils data is especially important in unsewered areas. Communities also need to consider limiting development around lakes and ponds to minimize eutrophication effects of septic tank effluent.

Farmers need to utilize good practices when dealing with animal wastes, pesticides, and fertilizer to minimize water pollution hazards. Farmers, forest landowners, and developers need to employ proven land treatment measures to reduce erosion and the resulting sedimentation of water courses.

7.2 Resource Base and Existing Programs

Sources of stream pollution are normally placed into one of two major categories: point or nonpoint sources.

Point sources are those where a large quantity of pollutants is discharged into a stream from a discreet, readily identifiable source. The most common examples of point sources include discharges from municipal sewage systems and industrial plants.

Nonpoint sources are more difficult to isolate. They usually involve relatively small quantities of pollutants which are discharged over relatively large areas. Examples of nonpoint sources include salt runoff from highways, animal wastes from agricultural enterprises, sediment from timber harvests and other sources, and excess fertilizer from fields. In the Berkshire Region, one of the more significant nonpoint pollution problems occurs from inadequately treated effluent from individual septic systems.

The Massachusetts Division of Water Pollution Control has established water quality standards[1/] for streams in the Berkshire Region. Streams were rated using the following classification:

"Class A--Waters designated for use as public water supply in accordance with Chapter 111 of the General Laws. Character uniformly excellent.

"Class B--Suitable for bathing and recreational purposes including water contact sports. Acceptable for public water supply with treatment and disinfection. Suitable for certain agricultural and industrial uses; excellent fish and wildlife habitat; excellent aesthetic value.

"Class C--Suitable for recreational boating and secondary water contact recreation; habitat for wildlife and common food and game fishes indigenous to the region; certain agricultural and industrial uses; under some conditions acceptable for public water supply with treatment and disinfection. Good aesthetic value.

"Class U[2/]Unsatisfactory river conditions not capable of meeting "C" standards."

The present stream conditions in the Housatonic River range from "B" to "U" with most of the river classified as "C". The present stream conditions in the Hoosic River range from "B" to "U" with most of the river, starting in Adams, classified as "U".

1/These standards were first established by the Massachusetts Division of Water Pollution Control in 1967. The standards in effect now were adopted in May 1974 and published in "Rules and Regulations for the Establishment of Minimum Water Quality Standards and for the Protection of the Quality and Value of Water Resources", Commonwealth of Massachusetts, Water Resources Commission, Division of Water Pollution Control, May 1974. Classifications based on the 1967 Standards remain in force until reclassified under the 1974 Standards. The Hoosic River is reclassified under the 1974 Standards and the Housatonic is expected to be reclassified within a month or two.

2/Not defined in the May 1974 "Rules and Regulations...", but included here to cover present water quality below the standards.

The established standard for the Hoosic River from Adams to the Massachusetts-Vermont state line is "C". Water quality standards for the tributaries, the upper part of the Hoosic River, and the North Branch are classified as "B". In the specific case where a stream is used for water supply, the established standard is "A".

The established standards for the Housatonic River are primarily "B", with a section from Pittsfield to the confluence with Kampoosa Brook in Stockbridge established as "C". From this point to the Connecticut state line, the Housatonic River has a "B" classification. Water quality standards for the tributaries are classified as "B", unless used as a water supply in which case the classification is "A". Established stream water quality standards for the region are shown on Figure 7-1.

Point Sources

Water quality improvement is an action program in the region. New secondary treatment plants, collection systems, and major interceptors have recently been built, and additional work is under construction.

The Pittsfield plant, now being renovated and expanded to provide advanced treatment, and phosphorus and ammonia removal, also treats waste from Dalton. In the near future, Hinsdale and North Lenox will connect to this plant. Hinsdale has no municipal treatment facilities while North Lenox is served by a primary treatment plant. This primary plant will be converted to a pumping station. Lanesborough is also considering a tie-in with the expanded Pittsfield plant.

Downstream of Pittsfield; Lenox Center, Lenoxdale, Lee, Stockbridge, and Great Barrington are served by secondary plants.

Industries along the Housatonic are under abatement orders to adequately treat their wastes. The P. J. Schwietzer, and Hurlburt Companies in Lee, both have their own secondary treatment facilities. Rising

FIGURE 7-1

WATER QUALITY STANDARDS

BERKSHIRE REGION

MASSACHUSETTS

UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

Paper Company is serviced by Great Barrington's new secondary treatment plant. Crane Paper Company in Dalton is tied into the Pittsfield regional plant and also will have company-owned treatment facilities.

In the Hoosic River watershed, Adams has recently constructed a secondary treatment plant. North Adams, Williamstown, Clarksburg and the R. J. Widen Tannery have joined in a regional system, the Hoosac Water Quality District. Present sewage treatment plants in North Adams will be abandoned after completion of the new facilities downstream in Williamstown on the site of Williamstown's present primary treatment plant. Clarksburg has a small sewered area which is connected to the North Adams system. Eventually, the remaining urban portion will probably be connected to North Adams and the regional system.

Most of the industries in the Hoosic watershed have or will have their wastes treated by municipal systems. An exception is the Charles Pfizer Company lime plant in Adams which treats its own wastewater.

Table 7-1 indicates the status of the Municipal Wastewater Treatment in the region.

Table 7-1 - Inventory of Municipal Wastewater Treatment Plants

Municipality 1/	1975 Population Served	Degree of Treatment	Design Capacity MGD 2/	Remarks
Adams	12,000	Secondary	10.2	New plant in operation
Clarksburg	300	-	-	Approximately 100 homes connected to North Adams. Will probably connect remainder of urbanized area to North Adams.
Dalton	8,100	-	-	Connected to Pittsfield plant.
Great Barrington	6,000	Secondary	3.2	New plant.
Hinsdale	-	-	-	Will connect to Pittsfield plant through Dalton.
Lanesborough	-	-	-	Will probably connect to Pittsfield plant.
Lee	4,800	Secondary	1.2	
Lenox (No. Lenox)	6,000	Secondary Primary	1.2 0.2	Two plants - Lenox Center and Lenoxdale. The No. Lenox primary plant will be converted to a pumping station and will connect to Pittsfield.
North Adams	19,400	-	-	Combined with Williamstown in Hoosac Water Quality District.
Pittsfield	54,000	Secondary	28.0	Regional Plant serving Dalton; expansion now under construction.
Stockbridge	7,500	Secondary	0.2	
Williamstown	7,900	Secondary	5.5	New plant under construction in Williamstown, interceptor also under construction from North Adams to plant site.

1/ The towns of Alford, Cheshire, Egremont, Hancock, Monterey, Mt. Washington, New Ashford, New Marlborough, Richmond, Sheffield, Tyringham, Washington and West Stockbridge rely on onsite subsurface disposal systems.

2/ MGD - million gallons per day.

With the improvements in municipal and industrial wastewater treatment facilities which have been installed, or are under construction, plus the installation of those projects in the planning stage, all major point sources of pollution will be receiving secondary treatment or its equivalent by 1977.

The Massachusetts Division of Water Pollution Control conducted detailed water quality surveys in 1965 and 1973 on the Hoosic River and in 1969 and 1974 on the Housatonic River. It is anticipated that by the next survey in 1977, the Hoosac Water Quality District facilities will be online, thus eliminating the last major remaining inadequately treated point sources in the Hoosic basin. Similarly, for the Housatonic River, once the regional system centered on the Pittsfield treatment plant and modifications to the General Electric facilities are completed, there will no longer be major inadequately treated point sources.

It is expected that the improvements to the municipal and industrial systems in the region should insure that designated water quality classifications can be met. In order to meet the designated standards, the treatment facilities will have to be operated at, or near, their design removal rates. The new municipal facility in Adams, which also treats wastes from three industries, has not been achieving the design Biochemical Oxygen Demand (BOD) removal efficiencies. The town is investigating methods which will achieve production of a high quality effluent from the plant.

Nonpoint Sources

Nonpoint sources of pollution are more difficult to locate and evaluate than point sources because of their unconcentrated nature. Individual sources tend to cause limited quantities of pollutants to enter lakes and streams. In the past, these nonpoint pollutants have been masked by the much more prominent point sources. As treatment plants are upgraded in the future, the effects of nonpoint pollution sources may become more readily apparent.

In the absence of quantitative data concerning the extent of nonpoint pollution in the region, the study has attempted to recognize potential nonpoint sources and subjectively evaluate their impact on water quality.

Individual subsurface sewage disposal systems are relied on exclusively by 13 towns in the region. Even in towns served by municipal sewer systems, residents in outlying areas must make use of individual septic tank-leach field systems.

In most cases, an adequately designed individual disposal system is able to treat and dispose of domestic sewage with little adverse effect on the groundwater. Unfortunately, many of the older systems in the region are inadequately designed. Also, septic systems usually do not remove significant amounts of nutrients such as phosphates and nitrates. An additional problem can be the adequate disposal of sludge from septic tank cleanouts.

In addition, soil conditions in much of the area are unsuitable for septic tank systems. Seasonally high water table, bedrock or hardpan, and low soil permeability are the most common limitations on the use of individual disposal systems. Table 7-2 indicates results extracted from detailed soil surveys in six of the region towns. Over 80 percent of the developable land in these towns has "severe" limitations for onsite septic tank disposal systems.

The November 1973 General Soils Report for Berkshire County indicates that similarly high percentages of land with severe limitation exist in most other region towns.

Development of leisure or second homes located around ponds and lakes has increased in the region in recent years. Most of these homes must use individual septic tank systems which, as noted earlier, remove insufficient quantities of nitrates or phosphates. When these chemicals enter a pond or lake, they hasten the eutrophication or aging process of the pond. The trend toward second home development around water bodies is expected to continue.

Table 7-2 Limitation for Onsite Septic Tank Disposal Systems 1/

City/Town	Area Mapped	Excluded Area 2/	Water	Unclassified3/	LIMITATION Slight	LIMITATION Moderate	LIMITATION Severe	Percent of Mapped Area with Severe Limitation
	acres	acres	acres	acres	acres	acres	acres	
Clarksburg	4,867	3,270	4	30	173	55	4,609	94.7
Great Barrington	21,065	7,723	622	268	2,963	330	17,504	83.1
Lee	16,688	0	662	779	503	582	14,824	88.8
Lenox	13,885	0	268	133	283	75	13,126	94.7
Pittsfield	18,022	8,188	945	846	1,909	251	15,016	83.3
Stockbridge	14,618	9	829	168	394	78	13,978	95.6

1/ From Soil Conservation Service, Operational Soils Reports. Ratings based on depth to seasonally high water table, bedrock or hardpan, slope, soil permeability, flooding hazard and surface stoniness.

2/ Excluded area is usually a built-up area, state lands, etc.

3/ Included gravel pits, stripped lands, made land, urban, etc.

Agriculture-related pollution can result from two main sources: animal wastes and runoff containing residues of fertilizer, pesticides, and herbicides. In the Berkshire Region, dairy cattle are the largest potential source of animal waste pollution. About 65 percent of the farms in the region raise cattle. In 1969, there were over 13,600 cattle and calves in Berkshire County. Using conservative figures, the cattle are estimated to produce over 150,000 tons of waste products each year.[1/] Unless properly managed, animal wastes present a water quality hazard. Because of the size of dairy farms in the area and their location in relation to water courses, animal waste is not considered to be a dominant pollution source. Proper manure storage and disposal techniques are expected to control the pollution hazard in the future.

Heavy use of commercial fertilizer is another agriculture-related nonpoint source of pollution. Fertilizer which is not utilized by crops can become a potential hazard if washed into waterways, ponds, or lakes. The high cost of fertilizer and the relatively low-value crops raised in the region tend to minimize fertilizer as a significant pollution source. In 1969, over 2,500 tons of commercial fertilizer were used on Berkshire County farms.

The use of pesticides and herbicides in agriculture is not expected to be a significant pollution source in the region. Pesticide use is regulated by the Pesticides Board, Massachusetts Department of Environmental Quality Engineering.

Soil erosion and the resulting sedimentation represent another aspect of nonpoint pollution. As indicated in Chapter 5, Erosion and Sediment, the region is not considered to be a major erosion and sediment problem area. The soils have low erodibility potential and the region is about 70 percent forested. Erosion in the region results mainly from cropland with inadequate land treatment, poor timber harvesting practices, construction sites, streambanks; and critical areas such as gullies, unstable slopes, and abandoned gravel pits.

1/ USDA, Soil Conservation Service, Agricultural Waste Management Field Manual, Washington, D.C., Chapter 4, August 1975.

Forest management activities can also cause nonpoint pollution problems. This is true where such activities as recreation, timber management, grazing, surface mining, road and trail construction and timber harvesting may occur. Certain water quality parameters, including water temperature, turbidity, total dissolved solids, nitrate-nitrogen and fecal coliforms, may all be affected by the manner in which the watershed is managed. The severity is dependent on the particular management activities and the percentage of the watershed affected by the activities. Through proper planning, the effects of land management on water quality can be minimized.

The Berkshire County Regional Planning Commission (BCRPC) is conducting a study to prepare a Water Quality Management Plan under Section 208 of the Public Law 92-500, the Federal Water Pollution Control Act, Amendments of 1972, for the Upper Housatonic area around Pittsfield. A regional land use and growth plan will be developed to integrate pollution control objectives with environmental, social, and economic considerations. Groundwater resources, wastewater treatment facilities, industrial wastes, combined sewer discharges and storm water drainage systems will be investigated.

A major objective of this study will be to define the nature and magnitude of the nonpoint pollution problem. Tentative solutions to water quality problems will also be formulated. Studies in other parts of the United States have shown that nonpoint sources may produce half of the pollution observed. The BCRPC study will attempt to see how true this is in Berkshire County.

7.3 Problems and Objectives

To insure a quality environment, it is essential that the streams, lakes, and ponds in the region meet the water quality standards established by the Division of Water Pollution Control. An adequate supply of water suitable for drinking, bathing, swimming, fishing, irrigation, and industrial use is important if the region is to maintain its present high quality of life.

New construction and improvements to existing treatment plants are expected to reduce point pollution enough to enable the region to meet water quality standards in the major streams.

The extent of the nonpoint pollution problem is difficult to determine. In the past, water pollution control programs have been directed toward reducing the pollution from point sources such as municipal treatment plants and industrial wastes. Nonpoint sources are less visible and probably have a less obvious effect on water quality than point sources. However, as point sources become less of a problem, interest will shift to evaluating and coping with nonpoint sources. One of the major problems in the nonpoint area will be to inventory and evaluate the nonpoint pollution sources in the region.

An increasing problem in the region is the degradation of the water quality in lakes and ponds due to nutrient enrichment. Most of this is man-induced and is often due to the concentration of unsewered development near these lakes and ponds. A state program has been established for controlling nuisance aquatic vegetation in lakes and ponds, using approved herbicides. [1/] Cheshire Reservoir (Hoosac Lake) in Cheshire, Pontoosuc Lake in Lanesborough and Stockbridge Bowl (Lake Mahkeenac) in Stockbridge have been treated and are scheduled for further treatment under this program. Applications for this treatment have been forwarded to the Massachusetts Water Resources Commission for other water bodies in the region. The use of this program in the region and the ongoing study of water quality of selected lakes and ponds by the Massachusetts Division of Water Pollution Control indicate that lake and pond water quality is a problem in the region. [2/]

1/ This program is conducted under the provisions of Chapter 722 of the Acts of 1969 which amended General Laws, Chapter 40, Section 5 and Chapter 111, Section 5F. Essentially, this program, conducted by the state with local cooperation, treats approximately 15 to 20 lakes and ponds each year in the Commonwealth.

2/ Cheseborough, Eben W. and Arthur J. Screpetis, <u>Baseline Water Quality of Selected Lakes and Ponds in the Housatonic River Basin, Berkshire County</u>, 1974, Massachusetts Divsion of Water Pollution Control, Westborough, Massachusetts, September 1975.

In the past, pollution from widely scattered homesites has not been too noticeable. Pollutants from these individual septic tanks were diluted and treated by natural processes in the ponds and lakes. However, when many homes are built on small lots, on soils with severe limitations for septic tanks, and in close proximity to lakes and ponds, inadequately treated effluent becomes a noticeable pollution source. Limited soil survey data indicate that more than 80 percent of the developable land in the region may have severe limitations for individual septic tank systems. Limitations are imposed primarily by a high water table, shallow bedrock and hardpan, and low permeability.

The primary objective in establishing a plan to enhance water quality is to improve the quality of the environment by insuring that the streams, ponds, and lakes in the region meet established water quality standards.

Specific components of this objective include:

1. adequate treatment of discharges from point sources to insure compliance with water quality standards,
2. adequate management of nonpoint pollution sources to minimize the threat of water pollution.

7.4 Needs

Major point pollution sources are expected to be controlled by new construction and improvements to existing wastewater treatment plants. These improvements are expected to enable the region to meet the 1977 water quality standards.

A continuing monitoring program will be needed to insure that the desired water quality goals are met and maintained in the future. When the present program of abatement of point sources is completed, a monitoring program will determine if additional levels of treatment are needed for some sources.

The extent of the nonpoint pollution problem needs to be quantified before a realistic program of abatement can be developed. The Berkshire County Regional Planning Commission is beginning a water quality study in nine region towns. The study, funded by the Environmental Protection Agency, will attempt to assess the impact on water quality of nonpoint sources of pollution. Results of this study will be helpful in assessing the extent of the nonpoint pollution problem in the rest of the region.

More emphasis needs to be placed on the limitations imposed by soil conditions on septic tank use. Soil surveys are needed to help guide development to areas which are suitable and away from areas with unsuitable soil that will result in pollution of ground or surface waters.

Residential development around the region's lakes and ponds needs to be carefully regulated to ensure that domestic sewage effluent does not cause eutrophication effects.

Farmers need to be aware of water pollution hazards in their operations. Good animal waste handling practices can go a long way toward reducing agricultural pollution. Wise use of fertilizer, pesticides and herbicides can also minimize pollution from this source.

Sedimentation of streams, lakes, and ponds needs to be reduced by the use of proven practices in land treatment, silviculture, and critical area treatment.

7.5 Alternatives

The ongoing programs of the local communities, Berkshire County Regional Planning Commission, the Massachusetts Division of Water Pollution Control, and the U. S. Environmental Protection Agency are on the verge of reestablishing high water quality in the streams of the Berkshire Region. In order to maintain water quality after construction of treatment works is completed, the Massachusetts Division of Water Pollution Control should continue to monitor the effectiveness of treatment processes and the quality of effluent.

Nonpoint pollution sources need to be evaluated to determine their magnitude and effects on water quality. Results of the "Section 208" water quality study being conducted by the Berkshire County Regional Planning Commission should be an indicator of the extent of nonpoint pollution problems in the remainder of the region.

Local communities should place more emphasis on soils limitations when planning for growth. Detailed soil surveys in several region towns indicate severe limitations existing for septic tank systems.

Communities adopting or updating local zoning ordinances need detailed soils information to intelligently guide growth to suitable areas. In some cases, the use of large residential lot size in certain soils can minimize septic tank-leach field problems which might develop if smaller lot size and greater density of development were permitted. Conversely, smaller lot sizes may require sewage collection systems because of inadequate soils for onsite disposal.

1. On the basis of projected population increases and the lack of municipal sewerage, the communities of Egremont, Monterey, New Marlborough, Richmond and Sheffield should obtain detailed soil surveys from the SCS to aid in guiding growth.

Euthrophication of the region's lakes and ponds appear to be hastened by residential development in the watershed. Nutrients from individual septic tanks eventually find their way to the pond or lake and speed the natural aging process.

2. The communties listed below should develop a lake water quality protection program. This program should include development of long range plans for sewage collection and disposal and immediate restriction of lake shore developments.

City/Town	Lake or Pond
Cheshire, Lanesborough	Cheshire Reservoir
Monterey	Lake Garfield
Monterey, New Marlborough	Lake Buel
Richmond, Pittsfield	Richmond Pond
Sheffield	Mill Pond
West Stockbridge	Mud Ponds & Shaker Mill Pond
West Stockbridge	Crane Lake

Water quality degradation from sedimentation can be limited by good land treatment, land management, critical area stablization, and good construction practices. Farmers, forest landowners, and developers are encouraged to make use of the technical assistance available from the Soil Conservation Service through the Berkshire Conservation District. Cost sharing for land treatment measures is available from the Agricultural Stabilization and Conservation Service. Specific recommendations for controlling erosion and sediment are outlined in Chapter 5, Erosion and Sediment.

CHAPTER 8 - WATER SUPPLY AND IRRIGATION

8.1 SUMMARY

The Berkshire Region has sufficient water resources to meet projected needs. The projected 1990 water supply deficits, 4.6 million gallons per day (MGD), can be supplied by either groundwater development or by small surface-water reservoirs. Pittsfield and Lenox, which together will need an additional supply of 4.1 MGD of the 4.6 MGD total deficit, are currently investigating groundwater developments to supply their needs. At the same time, both communities have potential surface water reservoirs.

8.2 Resource Base and Existing Programs

The Berkshire Region has an abundance of water. Around 5 percent of the total runoff, surface-water and groundwater, is used for domestic, industrial, agricultural or other purposes.

Domestic and Industrial Water Supply

The cities and towns have developed both surface-water and groundwater sources for water supply. Generally, the major industries depend on their own water supplies, usually groundwater, for most of their water needs. Supplementary industrial sources include municipal systems and direct river intakes.

In general, three institutional arrangements for water supply exist in the region:

1. individual systems only, usually wells or spring developments
2. individual systems and small public and/or private supply systems which serve only a small portion of the community's population
3. major portion of community's population is served by public and/or by private water companies.

Table 8-1, Water Supply and Consumption, presents pertinent data for the twenty-five cities and towns. Approximately 87 percent of the population is supplied by private water companies or public systems. The communities of Lenox, Monterey, New Marlborough, Pittsfield, Sheffield, Cheshire and Clarksburg have insufficient water supply to meet their 1990 needs.

Appendix B, Evaluation of Potential Reservoir Sites, and Figures 8-1 and 8-2, Unconsolidated Materials Ground Water Maps, indicate the potential for development of additional water supply. For much of the region, carbonate bedrock; limestone, dolomite and marble underlies the surficial unconsolidated materials. The valleys of the major rivers, the Hoosic and the Housatonic, are in carbonate bedrock. Generally, these carbonate areas have been avoided for water supply reservoir sites because of the water holding problems associated with this type of bedrock.

The U.S. Geological Survey indicates that wells in carbonate bedrock in the Housatonic Study Area vary tremendously in yield with a range from less than 1 gallon per minute (GPM) to about 1,400 GPM. The median or average yield is only about 9 GPM which is much less than that expected from the better unconsolidated groundwater sources.1/ For the Hoosic Study Area, the U.S. Geological Survey indicates that a linear corridor along the entire length of the Hoosic River, the Green River and the North Branch of the Hoosic is favorable for developing 50 GPM or more from carbonate bedrock. The width of this corridor varies from approximately one-quarter mile, in upstream reaches, to a maximum of approximately one-and-one-half miles along the Hoosic River in Williamstown.2/

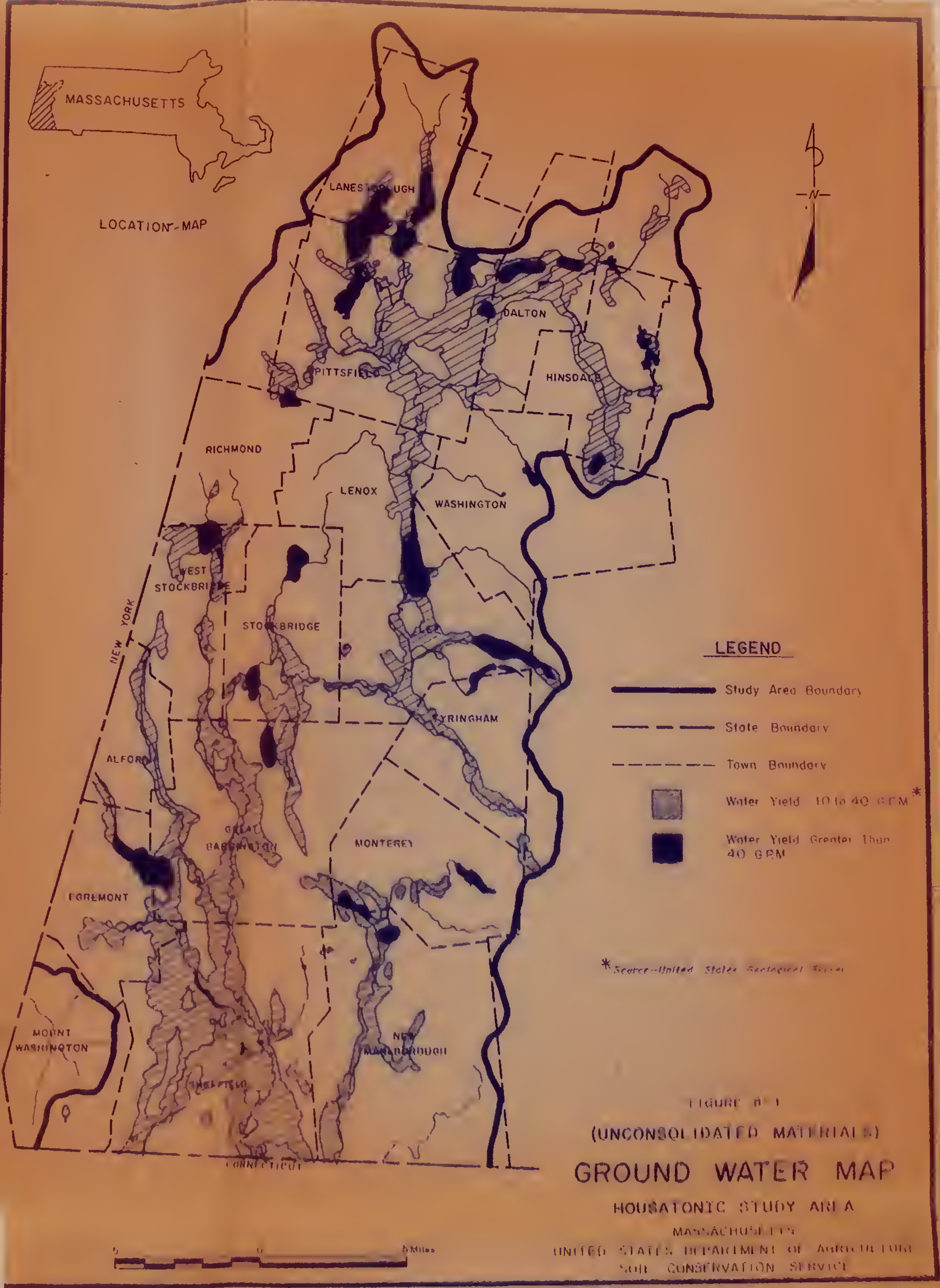
An additional 614 acre-feet (200 million gallons) of storage for municipal water supply for the town of Lee will be provided in Site No. 5, a multi-purpose reservoir to be located in October Mountain State Forest, town of Washington. This project is planned as a part of the Washington Mountain Brook Watershed Plan, prepared under the Watershed Protection and Flood Prevention Act (Public Law 83 566).

Rural Water Supply

In 1970, 19,000 people, approximately 13 percent of the region's population, were on individual private water supply systems. The rural domestic water supply consumption is approximately 1.5 million gallons per day (MGD).

1/ Horvitch, Ralph F., Donald F. Farrell, Felix H. Pauszek and Richard G. Petersen, Hydrology and Water Resources of the Housatonic River Basin, Mass., Hydrologic Investigations Atlas HA-281, U.S. Geological Survey, 1968.

2/ Hanson, Bruce P., L. G. Toler, Frederick B. Gay, Hydrology and Water Resources of the Hoosic River Basin, Mass., Hydrologic Investigations Atlas HA-481, U.S. Geological Survey, 1973.


MASSACHUSETTS
LOCATION MAP
N
LANESBOROUGH
DALTON
PITTSFIELD
HINSDALE
RICHMOND
LENOX
WASHINGTON
WEST STOCKBRIDGE
STOCKBRIDGE
NEW YORK
TYRINGHAM
ALFORD
GREAT BARRINGTON
MONTEREY
EGREMONT
MOUNT WASHINGTON
NEW MARLBOROUGH
SHEFFIELD
CONNECTICUT
LEGEND
Study Area Boundary
State Boundary
Town Boundary
Water Yield 10 to 40 GPM*
Water Yield Greater Than 40 GPM
5 Miles
(UNCONSOLIDATED MATERIALS)
GROUND WATER MAP
HOUSATONIC STUDY AREA
MASSACHUSETTS
UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

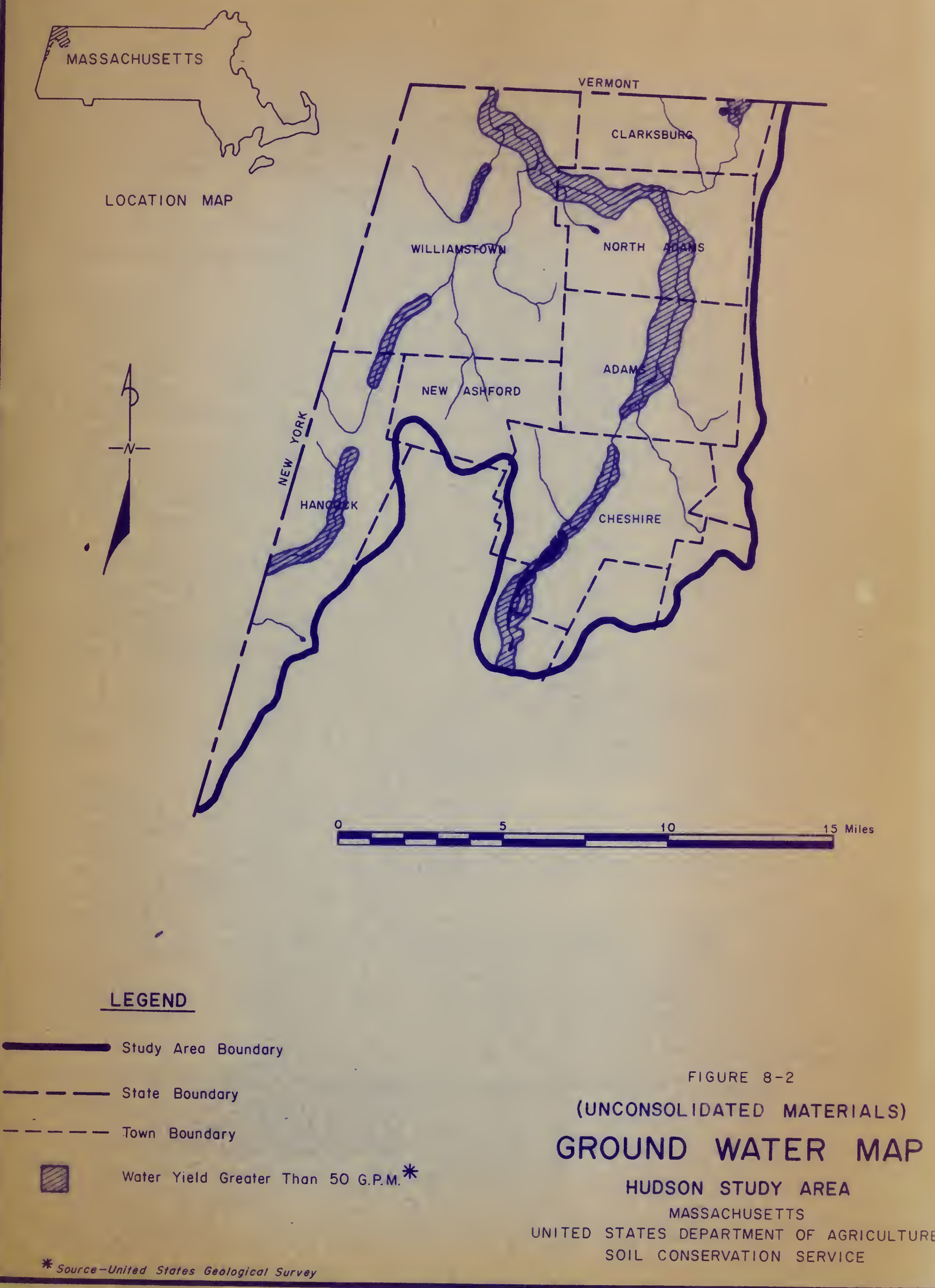


FIGURE 8-2
(UNCONSOLIDATED MATERIALS)

GROUND WATER MAP

HUDSON STUDY AREA

MASSACHUSETTS

UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

Table 8.1 - Water Supply and Consumption1/

City/Town	Rely entirely on individual wells and springs	Private water company	Industries with own supply	Municipal and/or public water district	1970 pop.2/ served by private water company or public system	Sources4/	Existing safe yield (MGD)	Average water consumption (MGD) 1970	1990
Housatonic Study Area:									
Alford	x								
Dalton		x		x	6,900	SW	1.94	0.82	1.09
Egremont		x			600	SW	0.16	0.06	0.15
Great Barrington		x	x	x	4,500	SW, GW	1.47	0.67	0.92
Hinsdale				x	1,000	SW	0.17	0.11	0.16
Lanesborough		x		x	2,700	GW	2.00	0.25	0.55
Lee			x	x	6,000	SW	1.53	0.99	1.24
Lenox3/				x	5,000	SW	0.64	0.68	1.10
Monterey		x			200	GW	<.05	<.05	0.12
New Marlborough		x			200	GW	<.05	<.05	0.05
Pittsfield			x	x	55,000	SW	11.9	13.4	15.5
Richmond		x			200	GW	<.05	<.05	.05
Sheffield		x	x		1,300	GW	0.20	.11	.23
Stockbridge		x		x	2,200	GW, SW	0.54	.34	0.54
Tyringham	x								
Washington	x								
West Stockbridge		x			600	GW, SW	0.24	.05	0.10
Subtotal	3	10	4	8	86,400		20.9	17.6	21.8
Hudson Study Area:									
Adams			x	x	11,700	GW, SW	5.62	2.09	2.42
Cheshire		x	x	x	1,600	GW, SW	0.20	0.14	0.31
Clarksburg		x		x	500	GW, SW	<.05	<.05	0.19
Hancock		x			100	GW	<.05	<.05	.05
Mt. Washington	x								
New Ashford	x								
North Adams			x	x	18,800	GW, SW	4.37	3.58	3.93
Williamstown		x		x	7,000	GW, SW	1.80	0.76	1.20
Subtotal	2	4	3	5	39,700		12.1	6.7	8.1
TOTAL	5	14	7	13	126,100		33.0	24.3	29.9

1/ Major source: Regional Plan for Water Supply and Sewerage, prepared for Berkshire County Regional Planning Commission by Curran Associates, Inc.
2/ All communities rely to some degree on individual water systems.
3/ Portions of town served by neighboring communities.
4/ GW - ground water, SW - surface water.

In the future, the percentage of the population having rural water supplies will decrease as the municipal systems are extended to the rural areas. However, the per capita use of water is likely to increase, which could cause an increase in the total amount of water used for rural domestic consumption.

Domestic consumption accounts for most of the total rural water use. A small part of the total rural water use is for agricultural consumption, which includes water used in the production of agricultural commodities. (Irrigation is presented separately in the next section). Agricultural consumption consists primarily of water needed for livestock. The agricultural consumption is expected to level off or decrease in the future in line with projected agricultural activity within the region. A major change or increase in agricultural activity would have to occur to offset this historic trend. Therefore, the agricultural consumption will comprise a minor portion of the total rural water use.

The source of rural water supplies is mainly from wells and springs. Farm ponds and other surface water supplies are also used as water sources for agricultural consumption. Within the past ten years, 358 farm ponds have been installed in the region.

Irrigation

About three-hundred acres are being irrigated in the region. This includes approximately 50 acres of agricultural land. The remaining irrigated land is nonagricultural: golf courses, ski areas and lawns of industrial and commercial properties. Irrigation, at present, amounts to only a small portion of the water demand picture, and this situation is projected to continue in the immediate future. The potential for greatly increased use of irrigation for agriculture exists in the region. A major portion of the agricultural land is suitable for irrigation.

Existing Programs

Communities are assisted in their water supply planning and implementation programs by the following agencies: regional--Berkshire County Regional Planning Commission; state--Massachusetts Division of Water Resources,

Department of Environmental Management (DEM), and Massachusetts Division of Water Supply, Department of Environmental Quality Engineering (DEQE); and federal--United States Department of Agriculture, United States Geological Survey, Department of Housing and Urban Development (HUD), Environmental Protection Agency (EPA), and others.

The Berkshire County Regional Planning Commission (BCRPC) has had a comprehensive water supply and sewerage plan prepared for Berkshire County.1/ BCRPC has continued to update this plan and to provide planning and technical assistance to communities for water supply.

At the state level, the Massachusetts Division of Water Resources, DEM, has responsibilities in collection of basic water resource data, coordination of and participation in water and related lands resource studies, such as this one, and water resource development and management. The Massachusetts Division of Water Supply, DEQE, responsibilities in public water supplies include collection of basic engineering data pertaining to public water supplies, allocation and environmental health engineering surveillance and control of public water supplies and related land resources and their development and assistance and advice to other governmental units including local communities.2/ The division, under the 1974 Federal Safe Drinking Water Act, will be responsible for setting up contamination and other standards for public water supply systems.

Existing federal programs related to water supply include the USDA Farmers Home Administration RC&D loans for community water storage facilities and for other soil and water development projects. The U.S. Geological Survey collects basic data and performs surveys, investigations, and research necessary for water supply planning. HUD furnishes grants for water supply planning and other community planning studies. EPA oversees the Public Water System Supervision Programs, State Program Grants and the Drinking Water Supply--Technical Assistance Programs.

1/ Curran Associates, Inc., Water Supply and Sewerage; Berkshire County, Mass.: Stage II--The Regional Plan, prepared for the Berkshire County Regional Planning Commission, Pittsfield, Massachusetts, June 1970.

2/ Noyes, John H., Massachusetts Natural Resource Agency Directory, Publication No. 29, Cooperative Extension Service, January 1975.

The U.S. Army Corps of Engineers is authorized by the Water Supply Act of 1958 to provide for the construction of water supply storage capactiy in their flood control structures.

The communities, or water supply districts within the communities, are the implementors of water supply projects. They can turn to regional, state and federal agencies for assistance, but ultimately, water supply is mainly a local responsibility in the region.

8.3 Problems and Objectives

The water supply objective within the region is to provide sufficient high quality water for domestic, industrial and agricultural use with the least environmental cost or impact.

Table 8-1, Water Supply and Consumption, indicates that Pittsfield and Lenox will have substantial 1990 water supply sytems deficits and that the smaller communities of Monterey, New Marlborough, Sheffield, Cheshire, and Clarksburg will also need to increase their supply by 1990.

There is little use of irrigation for agriculture in the region. This use may increase in the future but significant increase is dependent on a major reversal in agricultural land use trends. There is ample opportunity for development of water supply for irrigation. Sources could include wells, ponds, rivers and streams, and small impoundments.

Rural water users will continue to rely on wells and springs to meet any additional needs.

The chief regional concern in water supply is with municipal and industrial supply.

8.4 Needs

The 1990 municipal water supply deficits are projected to be:

Community	Approximate Deficit Average Daily Use--MGD
Pittsfield	3.6
Lenox	0.5
Monterey	0.1
New Marlborough	0.05
Sheffield	0.05
Cheshire	0.1
Clarksburg	0.2
Regional Total	4.6

8.5 Alternatives

Municipal water supply systems will continue to have improvements made to their distribution systems which could include storage tanks, pumping stations, new transmission mains, and extension of distribution systems. The Berkshire County Regional Planning Commission's Regional Plan for Water Supply and Sewerage presents improvements by municipality.

The options available for additional supply for the municipalities are illustrated below:

Municipality	Groundwater	Surface-Water	Connect to a regional system with
Pittsfield	x	x	
Lenox	x	x	Pittsfield
Monterey	x		
New Marlborough	x		Monterey
Sheffield	x		
Cheshire	x		
Clarksburg	x	x	North Adams

The option of connecting to a regional system may not eliminate the entire deficit for the newly formed region. This is the case for the Pittsfield and the Monterey regional system options. Traditionally, Berkshire communities have preferred home rule and control for such services as water supply. It is also much less "complicated" for a city/town to do for itself rather than to develop a regional system with neighboring communities. The regional option is usually the last consideration for a community with a projected supply deficit.

Pittsfield had developed plans to construct a surface-water reservoir (site 305 in Appendix B, Evaluation of Potential Reservoir Sites) on Windsor Brook in the town of Windsor. In addition, an out-of-basin diversion from Westfield Brook, which drains into the Westfield River and ultimately into the Connecticut River, would supplement the limited watershed yield of the proposed reservoir. This project would supply an additional 4.0 MGD.

In reviewing this proposed reservoir project, the BCRPC recommended that other alternatives be considered. BCRPC then investigated groundwater

potential within the city and ultimately concluded that groundwater yields in excess of the reservoir project yield could be developed on land adjacent to the East Branch of the Housatonic River, much of which is owned by the city. The quality of this groundwater source is presently being investigated, but preliminary findings indicate that hardness will be a problem. In Lenox, while there are opportunities to develop surface-water reservoirs, the town is investigating potential groundwater sources first. Often in Massachusetts, groundwater is found to be more economical than small surface reservoirs for comparable yields.

The water supply alternatives are therefore:

1. develop groundwater sources to supply the 4.6 MGD regional deficit projected for 1990
2. develop surface-water reservoirs to supply the 4.3 MGD deficit projected for Pittsfield, Lenox and Clarksburg.

CHAPTER 9 - FISH AND WILDLIFE

9.1 SUMMARY

The Berkshire Region has an abundance of trout streams, hiking trails, natural features, wildlands, and huntable land which combine to make the region a pleasant place in which to live, as well as a welcome retreat for the nature enthusiast and sportsman. The region includes a large portion of the truly rural lands found in the Commonwealth.

Residents, summer residents and vacationing recreationists have about 70,000 acres of quasi-public and public land on which they can enjoy fish and wildlife resources. In addition, access to the privately-owned rural land can often be obtained by asking permission of the landowner. Enjoyment of fish and wildlife resources takes many forms. Most people enjoy routinely seeing and hearing wildlife. Others enjoy photographing or studying wildlife, while others enjoy hunting game animals and fishing.

Fishery resources in the region meet almost all of the demand for quality fishing. However, fishing pressure on the more popular trout streams is often too great for existing numbers of trout present. Timely stocking of hatchery-raised fish meets some of the demand. Acquisition of public access to fishing areas, more intensive management of native fishery resources, improved methods of stocking trout, and increased public education appear to offer viable methods for developing better quality fishing.

Wildlife resources on the whole appear to be sufficient to meet present demand, but in the case of some species, supply cannot provide quality experiences. As land use changes occur, certain wildlife habitat will be lost and other habitat will be altered. Land use projections indicate a decline in the amount of agricultural land and an increase in urban and forestland. These latter changes may favor certain wildlife species which prefer a mature woodland habitat. A major land use management effort to insure a diversity of wildlife habitat, to acquire wildlife land for public use and to protect outstanding wildlife resources would insure a perpetuation of most of the wildlife resources presently available in the region.

9.2 Resource Base and Existing Programs

Public Access to Fish and Wildlife Resources

Any plan for the conservation of fish and wildlife resources must consider the ownership of habitat and the degree of public access to that habitat. Public enjoyment of these valuable resources is closely linked to legal and physical accessibility.

Public Lands in the Region

The Massachusetts Department of Environmental Management owns approximately 59,000 acres of land in the Berkshire Region. Both consumptive (hunting, trapping and fishing) and nonconsumptive wildlife uses are allowed on most of this acreage. Although timber production is the primary use of most of this land, it also contributes significantly to the wildlife habitat in the region. Forestland can be managed concurrently for both forest products and wildlife.

The Massachusetts Division of Fisheries and Wildlife owns 1,784 acres consisting of four separate areas. Land owned by the Division is managed primarily for the benefit of fish and wildlife. Hunting, fishing, trapping, wildlife study and other uses are allowed on three of the parcels totaling 1,516 acres. Only nonconsumptive wildlife uses are allowed on the Forbush Wildlife Sanctuary (268 acres), located in Hancock.

The United States Fish and Wildlife Service operates a fish hatchery on 180 acres of land in New Marlborough. Beginning in 1975, this hatchery was converted from the production of trout to Atlantic Salmon. An anticipated 100,000 salmon weighing 10,000 pounds will be raised annually and stocked in rivers where reestablishment of Atlantic Salmon is feasible. It is not expected that any of these salmon will be released in the region, as none of the streams have historically supported an anadromous fishery. The hatchery provides an additional public benefit by allowing visitors to tour the facility. Approximately 12,000 visitors tour the hatchery each year.

Cities and towns in the region own property which is often managed partially or totally for the benefit of wildlife. These civic holdings, which are used to some extent by wildlife total more than 4,000 acres. Generally, only nonconsumptive wildlife uses are allowed on these lands. Many of the towns have used financial assistance provided by the Massachusetts Self-Help Program or the U. S. Bureau of Outdoor Recreation Land and Water Conservation Fund to purchase these properties. Other properties have been obtained as land gifts from private citizens.

Sportsmen's Clubs

There are numerous sportsmen's clubs in the region of which ten own or lease a total of about 500 acres of land. These clubs practice varying degrees of habitat management on their properties. The clubs usually provide members with archery and shooting ranges and sponsor hunter safety courses in cooperation with the Massachusetts Division of Fisheries and Wildlife, and the Division of Law Enforcement.

Quasi-Public Lands

There are 27 quasi-public outdoor recreation areas (e.g., YMCA, Boy Scouts, Girl Scouts, Women's Club, church clubs, Audubon, Trustees of Reservations) encompassing about 9,500 acres of land in the region.

Collectively, these areas provide 80 miles of hiking and nature study trails and seven fishing areas on about 50 acres of water. Hunting and trapping are generally not allowed on these properties.

Private Land

Privately-owned land provides the majority of the wildlife habitat in the Berkshire Region. Unfortunately, an increasing amount of land is becoming unavailable for public enjoyment of wildlife.

Approximately 33 percent of the land in the region is closed to hunting because of urbanization or is posted against hunting or trespassing. With permission, much of this posted land could be used by sportsmen and others. In 1965, the Public Access Board found that 29 percent of the total mileage of named streams in the Hoosic River drainage was closed to public access and fishing use because of landowner posting. This percentage of nonaccessible streams has undoubtedly increased in the past decade. Table 9-5 indicates that nearly 30 percent of the pond, lake, and reservoir surface area in the region has no public access.

Many out-of-region people are acquiring summer homes and additional acreage in Berkshire County. Unfortunately, one of the first acts of many of these new landowners is to post their land against trespassing and hunting. Littering, disregard for personal property, unsafe hunting practices and personal opposition to hunting are often cited as the primary factors bringing about the decision to post land. It is expected that the trend toward increased posting of private land will continue in the future.

Public Access Board

This board of the Department of Fisheries, Wildlife and Recreational Vehicles utilizes a small portion of the state gasoline tax to acquire public access to great ponds[1/] and other waters in the state, as well as for trails for snowmobiling, hiking, and skiing. The board constructs launching ramps, canoe or small boat landings, parking areas, and approach roads.

1/Natural lakes or ponds more than 10 acres in size.

The Public Access Board will continue to construct facilities throughout the state. The board's program concentrates on the larger, more popular areas where many people will benefit from the facilities.

In the Berkshire Region, the board has been successful in acquiring access to the following waters:

Pond	Town	Area (acres)	User-days Provided
Laurel Lake	Lenox-Lee	151	15,900
Benedict Pond	Monterey-Gt. Barrington	35	3,700
Lake Buel	New Marlborough-Monterey	196	20,600
Pontoosuc Lake	Pittsfield-Lanesborough	480	50,400
Richmond Pond	Pittsfield-Richmond	219	23,000
			113,600

An access site is presently under consideration for Onota Lake in Pittsfield.

Most of the ponds where access has been acquired were previously open to the public on an informal basis. Provision for formal access points will ensure that the ponds will remain open to the public as well as provide public access to waters now closed to the public.

Wildlife Resources

Land Use and Vegetative Cover

Wildlife populations in an area are intimately related to the land use and vegetative cover. Different vegetative cover favors different wildlife species because of the individual species' special needs for nesting sites, food, and protective cover. Wildlife resources in the Berkshire Region include forest wildlife, wetland wildlife, and open

land or agriculturally related species of wildlife. Table 9-1 describes some of the more important land cover types in the region and their associated vegetation and wildlife, and Table 9-2 indicates the present land use and cover types within the region.

Forestland comprises about 70 percent of the present land use in the Berkshire Region.

For descriptive purposes, the forest wildlife habitat has been separated into four categories.

1. Upland Hardwood--This cover type comprises the majority of the forest acreage in the region. Stands vary widely in height and density, but the majority of the hardwood acreage consists of stands with trees 40 to 60 feet in height and of high density with 80 to 100 percent crown closure.

   Understory plants in the hardwood stands vary from sparse to abundant depending upon the amount of light getting through the forest canopy.

2. Bottomland Hardwood--This category is the wooded swamp classified as Type 7 Wetland by the U. S. Fish and Wildlife Service. Common tree species include red maple, black ash, green ash, and American elm.

3. Softwood--This cover type includes white pine, Eastern hemlock and red spruce. Understory plants are generally scarce in this forestland due to the dense canopy closure.

4. Mixed Hardwood and Softwood--These stands consist of mixtures of softwood and hardwood with one or the other being dominant. Understory plants vary from sparse to abundant.

Open land wildlife includes those species which prefer open agricultural land or land which has recently been abandoned and is beginning to revert to woodland through natural plant succession.

Two categories, agricultural land and abandoned agricultural land, are summarized in relation to their values to open land wildlife.

1. Agricultural Land--This cover type includes tilled or tillable cropland, pastureland, hayland, orchard and nurseries.
2. Abandoned Agricultural Land--Abandoned fields and orchards in some stage of plant succession which still include grasses, forbs and shrubs.

   Abandoned agricultural land is particularly valuable to a variety of wildlife. This type offers a variety of food plants, protective cover and nesting sites and is often near agricultural land or forestland which may provide additional habitat preferences. This cover type is, however, very short lived and rapidly succeeds to forest cover.

Wetlands comprise about seven percent of the Berkshire Region. About a third of the wetlands consist of wooded swamp described under the bottomland hardwood category. Open water in lakes, rivers and large streams, shrub swamp, and wooded swamp are the three most common wetland types.

Of the wetland types, the inland shallow fresh marsh, inland deep fresh marsh, and inland open fresh water are the most valuable to migratory waterfowl, shorebirds and wading birds. Shallow and deep marsh are especially valuable for feeding and brood production by waterfowl, whereas, the open water areas provide resting areas during spring and fall migration. Regionally important wetlands of high value to waterfowl and other wetland wildlife are identified in Chapter 6 of this report.

Plants found in wetlands of the region vary widely depending on the depth of water, period of flooding or stage of plant succession.

Other wildlife habitat is also provided by land used for recreation, power lines and urban uses. Nearly all land and land uses provide habitat for a variety of wildlife species.

High density urban land provides little habitat variety and consequently there is very little wildlife species diversity.

There are approximately 1,400 acres of power line, buried telephone cable, gas, and oil pipelines or other rights-of-way which are 100 feet or more in width and cross wooded areas. These lines are maintained in grass or low shrub and tree cover which will not interfere with the function of the transmission line or pipe. These lines are of benefit to wildlife, since they provide an extensive belt of low growing herbaceous and woody plants adjacent to tall woody cover. The resulting edge provides protective cover and food plants growing in close proximity to one another.

In general, the long-term trend of the Berkshire forestlands will probably favor those species of wildlife which prefer or require a habitat consisting of mature forest. Species which prefer mature forest include gray squirrel, fisher, turkey, porcupine and black bear.

The Berkshire Region is gradually losing agricultural land acreage and gaining in urban and forest acreage. This trend toward extensive unbroken forests will eventually result in an alteration of the relative abundance of wildlife species presently found in the region. Some species of wildlife will be significantly reduced in number while other species which prefer the mature forest habitat will increase in number.

For more specific projections on future land use, refer to Chapter 3, Land Use.

TABLE 9-1 LAND COVER AND ASSOCIATED VEGETATION AND WILDLIFE

LAND COVER TYPE	ACRES	PERCENT OF LAND IN REGION	VEGETATION ASSOCIATED WITH COVER TYPE		WILDLIFE ASSOCIATED WITH COVER TYPE		
			TREES	UNDERSTORY PLANTS	MAMMALS	BIRDS	REPTILES, AMPHIBIANS
Upland Hardwood	176,700	40.2	Northern red oak white oak scarlet oak black oak sugar maple American beech black cherry shagbark hickory white ash basswood black birch white birch red maple	hobblebush striped maple maple leaved Viburnum witch-hazel arrowwood wild raisin low-bush blueberry serviceberry flowering dogwood alternate dogwood sarsaparilla wintergreen partridgeberry	whitetail deer deer mouse woodland jumping mouse Eastern chipmunk white-footed mouse gray squirrel starnose mole shorttail shrew grey fox	ruffed grouse hairy woodpecker scarlet tanager slate colored junco black-capped chickadee pileated woodpecker	Northern black racer Eastern milk snake
Bottomland Hardwood (Type 7 Wetland)	10,300	2.3	red maple black ash green ash American elm	high-bush blueberry arrowwood wild raisin elderberry highbush cranberry speckled alder white hellebore winterberry honeysuckle skunk cabbage Jack-in-the pulpit	snowshoe hare raccoon boreal red-back vole whitetail deer Northern flying squirrel little brown Myotis	woodcock tufted titmouse wood thrush cedar waxwing yellow warbler catbird American redstart tree swallow	common garter snake Eastern ribbon snake spring peeper wood frog spotted salamander common newt gray tree frog wood turtle box turtle Eastern ringneck snake
Softwood	25,700	5.9	white pine Eastern hemlock red spruce - small plantations of: scotch pine red pine Norway spruce white spruce Some hardwoods are mixed in, including: red maple black cherry yellow birch black birch white birch American beech	striped maple hobblebush mountain laurel partridgeberry maple leaved Viburnum	whitetail deer red squirrel porcupine	blue jay screech owl common crow black-capped chickadee slate-colored junco starling pine grosbeak	

TABLE 9-1 LAND COVER AND ASSOCIATED VEGETATION AND WILDLIFE

LAND COVER TYPE	ACRES	PERCENT OF LAND IN REGION	VEGETATION ASSOCIATED WITH COVER TYPE: TREES	VEGETATION ASSOCIATED WITH COVER TYPE: UNDERSTORY PLANTS	WILDLIFE ASSOCIATED WITH COVER TYPE: MAMMALS	WILDLIFE ASSOCIATED WITH COVER TYPE: BIRDS	WILDLIFE ASSOCIATED WITH COVER TYPE: REPTILES, AMPHIBIANS
Mixed Hardwood and Softwood	88,800	20.2	Northern red oak sugar maple red maple American beech black cherry white ash basswood black birch yellow birch white birch white pine Eastern hemlock	arrowwood hobblebush wild raisin striped maple witch-hazel trailing arbutus mountain laurel shining clubmoss sarsaparilla maple leaved viburnum wintergreen partridgeberry	whitetail deer red squirrel gray squirrel porcupine gray fox raccoon starnose mole Northern flying squirrel white-footed mouse woodland jumping mouse striped skunk	ruffed grouse red-tailed hawk pileated woodpecker hairy woodpecker downy woodpecker yellow-bellied sapsucker blue jay common crow black-capped chickadee white-breasted nuthatch red-breasted nuthatch myrtle warbler rufous-sided towhee slate-colored junco evening grosbeak	Northern black racer Eastern milk snake American toad common newt spotted salamander
Wetland	11,600 1/	2.6		red maple highbush blue-berry buttonbush silky dogwood red osier dog-wood American elm speckled alder winterberry wild raisin arrowwood pond weeds coontail cattail various sedges arrowhead pickerel weed burreed white waterlily yellow waterlily duckweed reed canary grass purple loosestrife jewelweed	mink beaver raccoon muskrat otter little brown Myotis	American bittern mallard duck black duck coot green-winged teal blue-winged teal wood duck red-tailed hawk tree swallow catbird yellow warbler yellowthroat red winged black-bird Canada goose spotted sandpiper swamp sparrow bobolink common grackle little green heron great blue heron cedar waxwing short billed marsh wren	spotted turtle painted turtle Northern water snake common garter snake ribbon snake spring peeper blue frog green frog Pickerel frog leopard frog wood frog American toad common newt spotted salamander

1/ Figure does not include Type 7; bottomland hardwood, 10,300 acres; and open water (including Type 5), 7,500 acres.

MASSACHUSETTS WATER RESOURCES STUDY - BERKSHIRE REGION
TABLE 9-1 LAND COVER AND ASSOCIATED VEGETATION AND WILDLIFE

LAND COVER TYPE	ACRES	PERCENT OF LAND IN REGION	VEGETATION ASSOCIATED WITH COVER TYPE		WILDLIFE ASSOCIATED WITH COVER TYPE		
			TREES	UNDERSTORY PLANTS	MAMMALS	BIRDS	REPTILES, AMPHIBIANS
Open Land (Agricultural Land)	60,800	13.8	Trees grown include: domestic apple trees; ornamental trees and shrubs; Christmas trees	Crops and forage grown on this acreage include silage corn; vegetable crops, alfalfa, orchard-grass, timothy; red clover; alsike clover; bluegrass; tall fescue	whitetail deer; woodchuck; red fox; shorttail shrew; starnose mole; Eastern cotton-tail rabbit; meadow vole; meadow jumping mouse; striped skunk	yellow-shafted flicker; catbird; robin; sparrow hawk; red-tailed hawk; common grackle; cowbird; starling; rock dove; redwinged black-bird; English sparrow; Eastern meadowlark; mourning dove; field sparrow; Eastern kingbird; Eastern bluebird; ring-necked pheasant; common goldfinch; horned lark	smooth green snake; Eastern garter snake; American toad
Open Land (Abandoned Agricultural Land)	20,200	4.6	gray birch; quaking aspen; wild apple; domestic apple trees	orchard grass; timothy; sweet clover; little bluestem grass; goldenrod; ragweed; Canada thistle; burrdock; silky dogwood; elderberry; pasture juniper; multiflora rose; raspberry; blackberry; wild spirea; arrowwood; lowbush blueberry; highbush blueberry; wild strawberry	whitetail deer; red fox; shorttail shrew; Eastern chipmunk; Eastern cotton-tail rabbit; meadow vole; striped skunk; woodchuck; starnose mole	catbird; rufous-sided towhee; mourning dove; ruffed grouse; woodcock; song sparrow; fox sparrow; white throated sparrow; tree sparrow; slate-colored junco; brown thrasher	brown snake

MASSACHUSETTS WATER RESOURCES STUDY - BERKSHIRE REGION

TABLE 9-1 LAND COVER AND ASSOCIATED VEGETATION AND WILDLIFE

LAND COVER TYPE	ACRES	PERCENT OF LAND IN REGION	VEGETATION ASSOCIATED WITH COVER TYPE	WILDLIFE ASSOCIATED WITH COVER TYPE: MAMMALS	BIRDS	OTHER
Urban recreation and suburban land	30,200	6.9	grass ornamental trees ornamental shrubs	Eastern cottontail rabbit striped skunk Eastern chipmunk gray squirrel hairytailed mole shorttail shrew	slate-colored junco robin common oriole yellow warbler house wren mockingbird chipping sparrow song sparrow English sparrow black-capped chickadee cardinal common grackle rufous-sided towhee evening grosbeak blue jay starling catbird downy woodpecker white-breasted nuthatch ruby-throated hummingbird Eastern phoebe yellow shafted flicker	Eastern garter snake brown snake American toad
High density urban land				Norway rat house mouse	rock dove starling English sparrow nighthawk common grackle	
Powerlines, buried telephone cables, gas or oil pipelines	1,400	0.3	grass low shrubs trees which do not interfere with primary land use		ruffed grouse rufous-sided towhee slate-colored junco	

MASSACHUSETTS WATER RESOURCES STUDY - BERKSHIRE REGION
TABLE 9-2 LAND USE AND VEGETATIVE COVER 1/

TOWN	Urban	Hardwoods	Softwoods	Mixed Hardwoods-Softwoods	Agriculture	Abandoned Agriculture	Power Lines	WETLAND TYPES 2/ 1 & 2	3 & 4	Open Water 3/	6&8	7	Total Wetlands	Recreation	Mining or Waste Disposal
	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres
Adams	1,386	6,442	459	1,369	3,378	962	111	-	8	38	7	28	81	99	233
Alford	308	2,740	758	1,553	1,611	354	--	11	8	-	13	56	88	20	--
Cheshire	625	8,917	459	1,570	4,142	1,147	56	19	11	424	205	101	760	26	156
Clarksburg	643	4,870	354	1,103	486	446	3	46	8	49	56	18	177	35	43
Dalton	1,277	7,823	511	2,231	1,066	404	199	55	7	41	44	56	203	173	147
Egremont	952	2,624	1,717	2,249	2,938	704	--	27	57	97	139	73	393	506	37
Great Barrington	2,392	9,202	2,136	6,793	3,839	1,321	44	352	82	443	250	1,492	2,619	642	100
Hancock	223	17,277	193	1,324	1,797	1,293	15	41	8	29	204	20	302	322	--
Hinsdale	705	3,699	1,348	4,298	946	794	90	105	41	503	346	887	1,882	30	38
Lanesborough	751	10,319	353	1,516	3,749	921	149	58	36	453	294	169	1,010	163	41
Lee	1,650	6,307	799	3,252	2,412	874	41	306	79	542	256	443	1,626	117	298
Lenox	1,685	2,571	680	4,592	1,459	769	113	241	147	204	415	813	1,820	241	12
Monterey	585	7,801	2,254	4,621	1,006	306	27	65	271	605	325	148	1,414	4	46
Mount Washington	126	8,331	382	4,688	374	36	--	18	--	94	11	257	380	--	7
New Ashford	37	6,630	66	887	537	99	--	--	--	--	40	--	40	296	-
New Marlborough	677	8,652	3,429	10,442	4,072	801	--	284	477	528	465	395	2,149	--	38
North Adams	2,457	7,454	318	1,222	1,044	874	221	35	8	171	7	50	271	58	183
Pittsfield	7,267	3,639	1,107	4,099	3,838	2,875	182	328	58	1,168	810	746	3,110	803	248
Richmond	615	3,901	554	2,497	2,931	692	25	98	18	200	448	227	991	4	--
Sheffield	1,137	3,940	3,354	9,860	7,274	1,300	--	261	155	727	577	2,631	4,351	118	83
Stockbridge	1,488	3,612	770	3,625	1,869	650	80	193	105	624	512	1,205	2,639	192	55
Tyringham	158	5,013	462	3,627	1,229	286	29	103	84	117	514	34	852	--	--
Washington	209	11,607	2,592	7,797	397	721	--	188	223	310	253	321	1,295	--	33
West Stockbridge	510	5,336	265	2,102	2,269	550	--	22	98	55	455	107	737	15	87
Williamstown	2,319	17,965	422	1,501	6,136	982	19	11	--	101	67	7	186	389	97
TOTAL ACRES	30,182	176,672	25,742	88,818	60,799	20,161	1,404	2,867	1,989	7,523	6,713	10,284	29,376	4,253	1,982
Percent of Region	6.87	40.21	5.86	20.21	13.84	4.59	0.32	0.65	0.45	1.71	1.53	2.34	6.69	0.97	0.45

1/ Based on information provided by William P. MacConnell, et al. Remote Sensing 20 Years of Change, Massachusetts Agricultural Experiment Station, University of Massachusetts at Amherst, 1974.

2/ Wetlands of the United States, Circular 39, United States Department of the Interior, Fish and Wildlife Service, U. S. Government Printing Office, Washington, D. C., 1956.

3/ The categories presented here are: Types 1 & 2 - (1) Seasonally flooded basins or flats and (2) Inland fresh meadows,
3 & 4 - (3) Inland shallow fresh marshes and (4) Inland deep fresh marshes. Beaver ponds are included in this category.
Open Water - open water in lakes, rivers and large streams where water depth is over 3 feet, includes approximately 6,200 acres of Type 5 - inland open fresh water.
6 & 8 - (6) Shrub swamps and (8) Bogs
7 - Wooded swamps or bottomland hardwood

Outstanding or Unusual Wildlife Resources

Bog Turtle

This species has been classified by the U. S. Fish and Wildlife Service as "threatened", and in Massachusetts by the Massachusetts Division of Fisheries and Wildlife, as "endangered". Although not endangered by extinction, the turtle is very rare throughout its natural range. Bog turtle have been identified in only three small bogs in Massachusetts, all of which are in the Berkshire Region. One of these bogs is in the town of Lenox and the other two bogs are in the Pittsfield area.

Timber Rattlesnake

The timber rattlesnake, an uncommon species in Massachusetts, is known to occur on various hills from Pittsfield south to the Connecticut border. A record 6-foot 2-inch, timber rattlesnake was taken near Sheffield, Massachusetts. This specimen is reported to be the largest recorded timber rattlesnake taken anywhere.

Carolinean Vegetation

Unusual Carolinean vegetation and associated wildlife habitat is found along Schenob Brook, in the town of Sheffield. Unusual vegetation includes plants normally found much further south such as the prickly ash, hackberry, tuliptree and a variety of southern oaks. Sheffield is the only town in the region where the hognose snake is known to occur.

Indiana Bat

Limestone caves in the region have been reportedly used by the Indiana bat. Berkshire County has some caves where this species has been found in Massachusetts. This bat has been classified as "endangered" by the U. S. Fish and Wildlife Service and by the Massachusetts Division of Fisheries and Wildlife. This species may face extinction if maternity sites and other habitat needs are not protected.

Deer

Some of the highest deer populations occurring in Massachusetts are found in the towns of Alford, Egremont, Hancock, Monterey, Mount Washington, West Stockbridge, and Williamstown.

Wild Turkey

Wild turkey have been reestablished in the town of Mount Washington. Turkey have been released in other areas of the region, but it is too early to determine if they have become established.

Mount Greylock

Unusual flora and fauna are found atop Mount Greylock, in the town of Adams. Canadian Zone vegetation occurs on Mount Greylock. Examples include the stunted, windswept red spruce. Species of songbirds which have been reported to breed here and seldom, if ever, in other portions of Massachusetts are the Bicknell's thrush and black-poll warbler. Fishers have been observed on the lower slopes of Mount Greylock. The Brauns holly fern, a rare fern in Massachusetts, has been identified on the slopes of Mount Greylock.

Black Bear and Bobcat

A large portion of the remaining black bear and bobcat habitat in the state is located in the Berkshire Region.

High quality wetlands

Approximately 230 acres of wetlands, having high value for wetland wildlife, are located along the Hoosic River between the Cheshire town center and Cheshire Harbor, in the town of Cheshire.1/

1/The wetland types as defined by the U. S. Fish & Wildlife Service Circular 39, Wetlands of the United States, and acreage of each type are seasonally flooded flats, Type 1, 12 acres; inland fresh shallow marsh, Type 3, 2 acres; inland fresh deep marsh, Type 4, 3 acres; and shrub swamp, Type 6, 213 acres. These areas were measured from Massachusetts Map Down Land Use Maps.

About 920 acres of high quality wetlands of especial value to waterfowl and furbearers are located along the Housatonic River in Lenox and Lee.1/ Much of this wetland acreage is owned and managed by the Massachusetts Division of Fisheries and Wildlife.

Extirpated Species of the Region

A number of species were present in the Berkshire Region, and indeed, throughout most of the northeast which have since been extirpated. The causes of such species reductions are varied but usually involved the loss of suitable habitat.

The following is a listing of several species present during colonialization and their approximate dates of extirpation in the Berkshire Region:2/

Moose - last one reported was killed during the 1920 deer season.

Canada Lynx - present in 1904. Extirpated by 1930.

Eastern Wolf - present in 1829. Extirpated by 1900.

Wild Turkey - Extirpated by 1829.

Passenger Pigeon - Rare in 1900. Extirpated by 1912.

Eastern Cougar - Very sketchy early records. No date of extirpation available. Little recorded information.

1/ The wetland types as defined by U. S. Fish & Wildlife Service Circular 39 and approximate acreage of each type are seasonally flooded flats, Type 1, 50 acres; inland fresh meadows, Type 2, 50 acres; inland fresh shallow marshes, Type 3, 70 acres; inland fresh deep marshes, Type 4, 100 acres; shrub swamp, Type 6, 220 acres; and wooded swamp, Type 7, 430 acres. In addition, approximately 50 acres of inland open fresh water, Type 5, are adjacent. Acreage figures are based on those published in A Report on the Housatonic River Flood Plain and the Inland Wetlands in the Town of Lenox and a similiar report for the town of Lee, both produced by Robert G. Brown and Associates, Inc., Lee, Massachusetts.

2/ Data provided by Leo M. Daly, biologist, Massachusetts Division of Fisheries and Wildlife, Pittsfield, Massachusetts.

Recreational Uses of Wildlife

Nonconsumptive

Nonconsumptive recreational uses of our wildlife resources include bird watching, nature study, and wildlife photography.

A 1970 survey of outdoor recreation activities estimated that about two percent of persons 12 years and older participate in wildlife photography and four percent participate in bird watching.

Besides the active wildlife enthusiast, most Massachusetts residents enjoy observing song birds and other wildlife as a part of their daily routine. A study conducted by the U. S. Forest Service, in a western Massachusetts town, found that 43 percent of the householders fed wild birds.

Consumptive

Approximately 2.4 percent of the Massachusetts population participates in hunting game species in the Commonwealth. In the Berkshire Region, hunting is more popular than elsewhere in the state. A 1971 study indicated that at least 12,000 hunters (both regional resident and out-of-state licensees) hunted in Berkshire County. Thousands of other Massachusetts residents from outside of the region also hunt in the region.

Small Game Hunting

Hunter preferences for small game species in the region, in descending order of preference are: ring-necked pheasant, cottontail rabbit, ruffed grouse, gray squirrel, raccoon, snowshoe hare and American woodcock. Other species which may be legally hunted are opossum, red fox, gray fox, bobcat, crow and woodchuck.

Ring-necked pheasant are available for hunting principally as a result of annual stocking by the Massachusetts Division of Fisheries and Wildlife. Most of the Berkshire Region does not have appropriate open agricultural land on which grain crops are raised to meet optimum habitat requirements of the pheasant. Winter survival and natural brood production is insignificant throughout the region. Approximately 3,100 ring-necked pheasant are released annually for hunting. Suitable covers in which to stock pheasant in Berkshire County are in good supply in some towns though scarce in the higher elevation, more wooded towns.

The New England cottontail rabbit is native to the region and occurs in a variety of vegetative cover types. The Eastern cottontail, which appeared around the turn of the century, prefers and is found in greatest densities in brushy thickets adjacent to active agricultural land or in transition cover found in abandoned fields and orchards. The New England cottontail favors second growth woodlots and adjacent edges. Approximately 20,200 acres (6.7 percent) in the region consists of abandoned agricultural land well suited to cottontail rabbit. As this acreage succeeds to forest cover, this rabbit habitat will be lost. Future high quality cottontail rabbit habitat is more likely to be derived from additional abandonment of agricultural land.

Ruffed grouse prefer woodland edges, early succession forest stages and abandoned orchards with considerable tree seedlings and saplings. Since early succession forest stages supporting aspen, birch, hawthorne and other preferred shrubs and trees are quite short lived, high quality ruffed grouse habitat is usually lost in only a 20-year period.

High quality ruffed grouse habitat is in generally short supply in the region and will probably become more scarce.

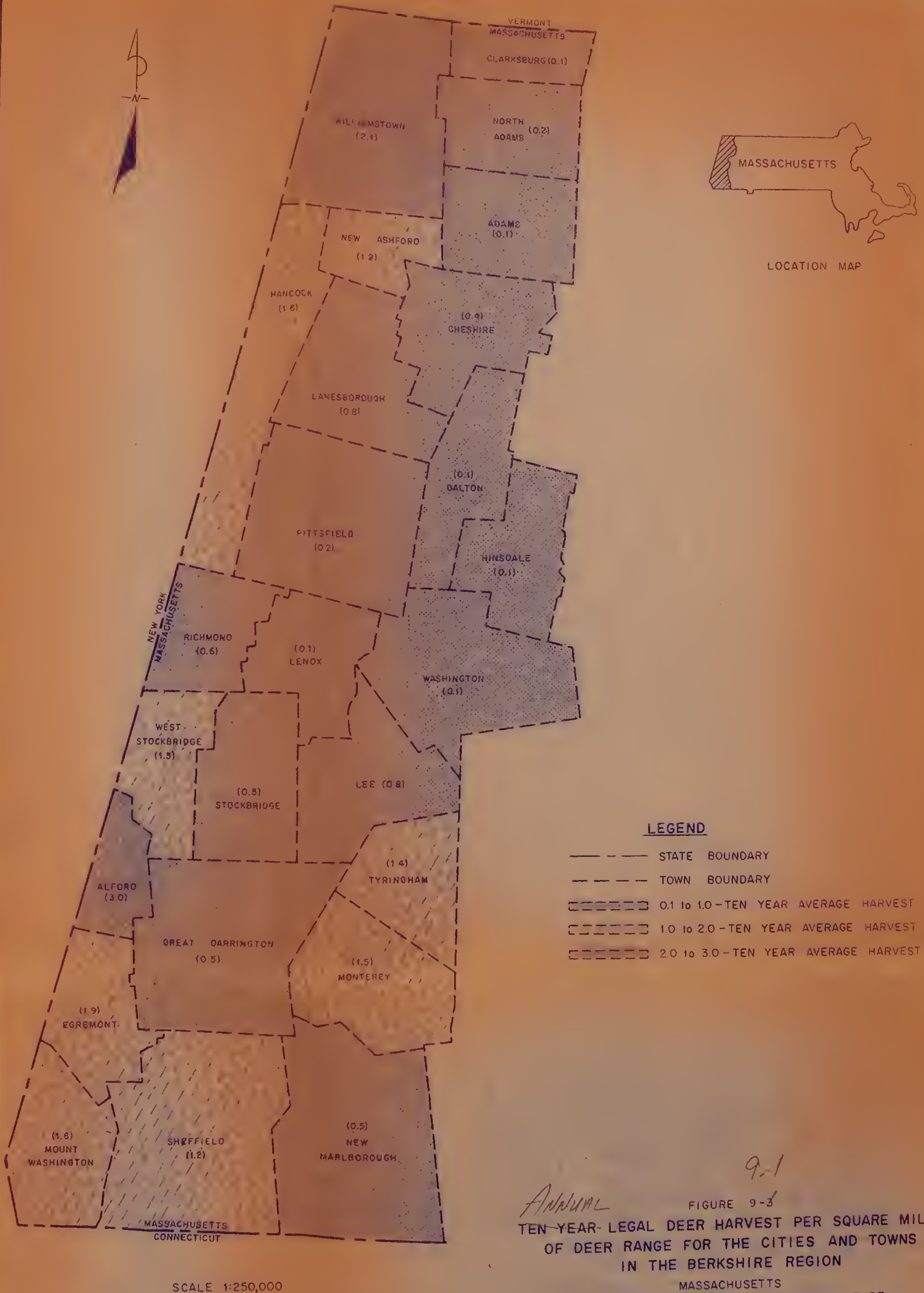
Gray squirrel habitat is abundant in the region and is becoming even more abundant. Gray squirrel are common and might be thought of as an under-harvested game species.

Snowshoe hare habitat is scattered throughout the region and will probably increase in the future. Existing populations fluctuate drastically which is common for this species. Some supplemental stocking of hare is conducted annually by the Division of Fisheries and Wildlife, although the practice is of limited benefit.

Big Game Hunting

Black bear and white-tailed deer are the big game species present in the region. Black bear are uncommon and contribute very little to the total hunter activity days spent afield in the region, but they offer diversification to the hunter and they are important to the small number of dedicated bear hunters.

Berkshire County has a higher deer density than any other county in Massachusetts, excluding the offshore islands. Approximately one-fourth to one-third of the annual state deer kill is taken in this one county. The interspersion of agricultural land with forestland and an active timber harvest program combine to provide fair to good habitat conditions for white-tailed deer. Particularly good deer hunting is available in the towns of Alford, Egremont, Hancock, Monterey, Mount Washington, Sheffield, West Stockbridge, Tyringham, New Ashford and Williamstown where averages of more than one deer per square mile of deer range are harvested annually (see Figure 9-1). Table 9-3 provides data on the 5-year mean legal harvest per square mile of deer range



9-1

FIGURE 9-3

Annual ~~TEN YEAR~~ LEGAL DEER HARVEST PER SQUARE MILE OF DEER RANGE FOR THE CITIES AND TOWNS IN THE BERKSHIRE REGION

MASSACHUSETTS
UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

MASSACHUSETTS WATER RESOURCES STUDY - BERKSHIRE REGION
TABLE 9-3 DEER RESOURCE DATA1/

TOWN	5 Year Mean (1949-1953) Legal Harvest Per Square Mile of Range	5 Year Mean (1969-1973) Legal Harvest Per Square Mile of Range	Net Change In Harvest 1949-1953 Mean vs. 1969-1973 Mean Per Square Mile of Range	1951 Deer Range2/ (Square Miles)	1971 Deer Range2/ (Square Miles)	NET CHANGE (Square Miles)
Adams	0.19	0.15	- 0.04	18.6	18.3	- 0.3
Alford	1.40	3.58	+ 2.18	10.3	9.7	- 0.6
Cheshire	0.50	0.43	- 0.07	24.0	23.0	- 1.0
Clarksburg	0.18	0.04	- 0.14	12.1	11.2	- 0.9
Dalton	0.22	0.05	- 0.17	19.3	18.6	- 0.7
Egremont	1.12	1.70	+ 0.58	14.9	13.8	- 1.1
Great Barrington	0.72	0.56	- 0.16	37.2	36.9	- 0.3
Hancock	1.18	1.40	+ 0.22	34.0	33.8	- 0.2
Hinsdale	0.78	0.10	- 0.68	20.3	18.8	- 1.5
Lanesborough	0.49	0.74	+ 0.25	26.3	25.0	- 1.3
Lee	1.42	0.95	- 0.47	23.2	20.9	- 2.3
Lenox	0.20	0.14	- 0.06	19.0	17.3	- 1.7
Monterey	2.24	1.61	- 0.63	27.0	25.3	- 1.7
Mount Washington	1.94	1.23	- 0.71	22.0	21.8	- 0.2
New Ashford	0.45	1.28	+ 0.83	13.3	13.0	- 0.3
New Marlborough	0.80	0.65	- 0.15	45.0	41.3	- 3.7
North Adams	0.18	0.14	- 0.04	17.3	16.8	- 0.5
Pittsfield	0.32	0.10	- 0.22	27.6	25.9	- 1.7
Richmond	0.73	0.57	- 0.16	16.1	15.4	- 0.7
Sheffield	0.75	1.17	+ 0.42	38.4	38.7	+ 0.3
Stockbridge	0.70	0.42	- 0.28	20.9	18.3	- 2.6
Tyringham	2.09	1.72	- 0.37	17.2	16.7	- 0.5
Washington	0.64	0.03	- 0.61	37.6	37.4	- 0.2
West Stockbridge	0.46	1.41	+ 0.95	16.0	16.1	+ 0.1
Williamstown	1.44	2.12	+ 0.68	40.3	38.0	- 2.3
TOTALS:	Comparing 1971 to 1951 - 8 towns have an increased deer harvest, and 17 towns have a decreased deer harvest.			597.9	572.0	-25.9
				Year - 1951	Year - 1971	Net Loss at end of 20 Year Period

1/ Sczerzenie, Philip, Land Use Changes and White-tailed Deer in Massachusetts, Unpublished M. S. Thesis Data obtained through personal communications, University of Massachusetts, 1976.

2/ Deer Range was derived from information provided by William P. MacConnell et al, Remote Sensing 20 Years of Change, Massachusetts Agricultural Experiment Station, University of Massachusetts at Amherst, 1974. Deer range includes all land use and cover types except: Agricultural types T, CB, N, S; Wetland types W, TSM, ISM, DSM; Mining and Waste Disposal, Urban Land and Outdoor Recreation. Recreation type - RSK - ski areas was included in the deer inventory.

in each town of the region for the period 1949 to 1953 and the period 1969 to 1973. During the 1974 deer hunting season, all 25 towns in the region had a deer harvest. Harvest in the region averaged 0.9 deer per square mile of deer range. This is a far better average than the statewide average which is only 0.4 deer harvested per square mile of deer range.

In 1951, there were 598 square miles of deer range in the Berkshire Region. In 1971, there were 572 square miles of deer range. During this 20-year period, there has been a loss of approximately 26 square miles or 4.3 percent of the deer range acreage (see Table 9-3).

Although deer range is gradually diminishing, it still constitutes approximately 80 percent of the region.

Comparing mean deer harvest per square mile of range for the period 1949 to 1953 and the period from 1969 to 1973, it is apparent that in 1971 there were eight towns which had an increased deer harvest and 17 towns which had a decreased deer harvest (see Table 9.3).

During the last eight years, the deer population in the region has been increasing due primarily to the institution of an antlerless deer permit system which has restricted and reduced the harvest of antlerless deer.

Further increase in the deer herd can be expected if: (1) The present agricultural acreage is largely retained. (2) Timber harvesting is accelerated which will provide more understory plants as browse. (3) No large scale adverse land use changes occur. (4) The antlerless permit system is maintained. The deer range of the Berkshire Region is generally in fair to good condition, capable of supporting a high deer population.

Waterfowl Hunting

Shallow and deep marshes; open water areas; and the wider, slow moving valley streams provide the majority of the waterfowl hunting lands in the Berkshire Region. Preferred waterfowl hunting areas consist of shallow and deep marshes; however, there is not sufficient acreage of these higher quality wetlands to meet peak day hunting pressure in the region. Although additional acreage of shallow and deep marsh could be developed in the region, the high development cost is prohibitive.

In 1971 there were approximately 900 waterfowl hunters in the region. Waterfowl hunters in the region constitute three percent of the total number of waterfowlers in the Commonwealth.

Significant waterfowl hunting areas in the region are the large wetland areas and oxbow ponds located along the Housatonic and Hoosic Rivers.

The most common species taken by the waterfowl hunter in decreasing order of occurrence are: wood duck, mallard, and black duck. These species are also the most preferred ones to hunt in the region. Canada geese are infrequently taken and are considered a trophy bird.

Trapping

In 1970 there were 87 licensed trappers in the Berkshire Region. Since 1970, there has been increasing interest in trapping due largely to the higher pelt prices being paid. Approximately 100 trappers are expected to operate traplines during the 1975-76 trapping season in the Berkshire Region.

Although most persons engaged in trapping do so as a form of outdoor recreation, the prices paid for pelts has a very definite influence on the intensity of trapping conducted by individual trappers as well as the number of persons

participating in the activity. From 1960 to 1970, the number of licensed trappers in Massachusetts fluctuated from 650 to 800. With increased pelt values being about 1970, the number of trappers statewide has increased to an estimated 1,000 at the beginning of the 1975-76 trapping season. From the 1970-71 season to the 1974-75 season, the statewide furbearer harvest and pelt value increased, as follows:

SEASON	TOTAL PELT HARVEST (All Species)	TOTAL RAW PELT VALUE (Dollars)
1970-71	56,387	$ 85,372.00
1971-72	47,285	107,876.00
1972-73	50,556	179,558.00
1973-74	80,662	312,277.00
1974-75	75,988	335,651.00

Increasing demand from European furriers for American furs has been largely responsible for increasing pelt values.

To the trapper, the most popular species to trap are those that bring the highest price and those that are the most abundant. In the Berkshire Region, the most popular species in order of importance are beaver, muskrat, raccoon, mink, red fox and otter. Other species which may be trapped include striped skunk, opposum, gray fox, weasel and bobcat; however, these species either have low pelt value or are difficult to trap and, consequently, few are harvested. Of the six most valuable furbearer species trapped during the 1974-75 trapping season in Massachusetts, their monetary value was as follows:

Muskrat	-	$211,990.00
Raccoon	-	53,043.00
Beaver	-	36,025.00
Mink	-	13,712.00
Red Fox	-	13,149.00
Otter	-	2,527.00

Future trapping activity in the Berkshire Region is difficult to predict since it is dependent on future fur markets, fashion trends and public attitudes toward natural furs and trapping. The future of trapping based on furbearer resources is good, due to present low harvests, good furbearer habitat and the availability of areas to trap.

Fishery Resources

Fishery resources in the region include both cold and warm water fish populations living in fresh water ponds, lakes and streams.

Pond and Lakes

Table 9-4 summarizes fisheries and physical data on the 139 bodies of water located in the Berkshire Region.

Streams

Small, high gradient mountain streams comprise the greatest number and mileage of streams in the region. The larger, valley bottom streams such as the Housatonic, Green and Hoosic Rivers have a flatter gradient and often have a meandering flow pattern. Both the mountain and valley streams support trout, but brook trout are most common in mountain streams and brown trout are more often found in the larger valley streams. (See Figures 9-2 and 9-3).

Most of the perennial streams in the Berkshire Region support native brook or brown trout, and many streams support both of these species. The brook trout is a true native of North America, whereas the brown trout, a native of Europe, has been successfully introduced through stocking and is now naturalized in many streams.

The Green River through the towns of Great Barrington and Alford has been found to have the ability to support rainbow trout for one or more years after stocking. Successful rainbow trout reproduction has not been reported in the river, but the "carry-over" of this species is unusual and noteworthy.

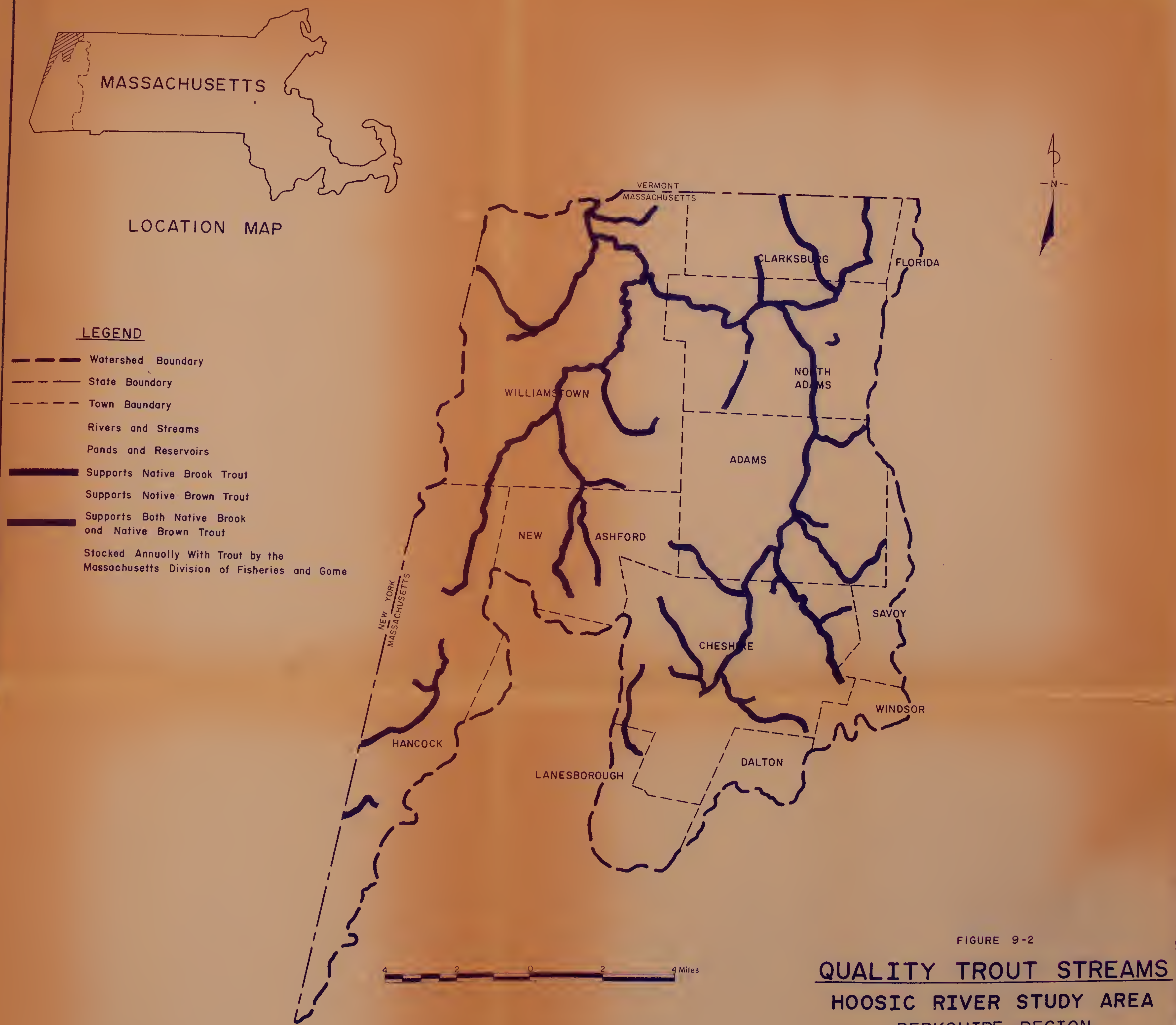


FIGURE 9-2

QUALITY TROUT STREAMS

HOOSIC RIVER STUDY AREA

BERKSHIRE REGION

MASSACHUSETTS

UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

FIGURE 9-~~1~~3

QUALITY TROUT STREAMS

HOUSATONIC RIVER STUDY AREA
AND BASHBISH BROOK WATERSHED
BERKSHIRE REGION
MASSACHUSETTS
UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Due to heavy fishing pressure and fisherman preference for large trout, the Massachusetts Division of Fisheries and Wildlife raises trout in hatcheries and stocks them throughout the Commonwealth. Although fish stocking is an artificial means of meeting fisherman preferences, it has proved highly successful in the more populated states such as Massachusetts. The sportsman's preference for the larger, stocked trout has resulted in reduced fishing pressure on the native brook trout. Stocking trout has also led to the establishment of brown trout populations in 21 percent of the perennial streams in the region. Naturalized brown trout are now found in about 191 stream miles, or 44 percent of the total perennial stream mileage in the region. Table 9-5 summarizes the native and stocked trout stream mileage in the region.

Several of the larger streams in the region support both cold and warm water species of fish. In the Housatonic drainage, the Housatonic River and Ironwork Brook both support largemouth bass and chain pickerel in addition to the trout fishery. About 35 miles of the Housatonic River and six miles of Ironwork Brook contain both warm and cold water species of fish. In the Hudson drainage, a three-mile reach of the Hoosic River supports northern pike and a brown trout fishery.

Recreational Use

The present population of the Berkshire Region is about 150,000 people. House Document 5170, published by the Massachusetts Water Resources Commission in 1967, indicated that approximately 42,600 people in the region participate in fishing. This report estimated the total recreational demand for fishing to be 588,300 user-days per year. This estimate assumes 13.8 user-days per fishing participant per year.

Each pond, lake or stream with natural fish populations can provide sport fishing to the extent that the number and pounds of fish harvested constitute a surplus of the resident fish. Sport fishing harvests should not, but sometimes do, exceed the surplus amount and decrease the fishery below the carrying capacity. Examples of depressed fishery in the Berkshire Region are Onota Lake and Cheshire Reservoir where northern pike have been reduced below the carrying capacity. Ideally, to protect the resource base, the amount of fishing pressure allowed should not deplete the fishery below surplus levels. Using current data on average allowable harvests for streams and impounded waters, and assuming that the fishing public would be satisfied with an average harvest of 0.2 pound of fish per fishing trip, the hypothetical number of fishing user-days available in the region can be calculated. Alternative assumptions as to what constitutes an acceptable catch would, of course, provide different estimates of the fishing capacity of the region.

A project for watershed protection and flood prevention has been authorized for construction by the U. S. Department of Agriculture, Soil Conservation Service, in the Washington Mountain Brook Watershed. Three multiple-purpose dams will be constructed as part of the project. As a result of this construction, over 320 acres of new lake area will be created. The lakes will be managed for a combination warm and cold water fishery.

On a sustained annual yield basis, these new lakes should provide approximately 34,100 additional user-days of quality fishing.

Many landowners in the region have constructed ponds on their property for personal recreation, primarily swimming and fishing. Most of the ponds were built with technical assistance provided by the U. S. Soil Conservation Service. Soil Conservation Service records indicate that over 250 ponds have been built in the Berkshire Region. These ponds range in size from one-sixth of an acre to

Table 9-4 Summary of the Ponds, Lakes and Reservoirs 1/

Number of Ponds, Lakes and Reservoirs	Total Acres Surface Water	Fishery Type Number of Ponds and Total Acres: Cold Water (no.)	Cold Water (ac.)	Warm Water (no.)	Warm Water (ac.)	Ponds, Lakes, or Reservoirs used exclusively for drinking water (no.)	(ac.)	Artificial Ponds or Reservoirs (no.)	(ac.)	Ponds with Public Access Available (no.)	(ac.)
139	5,718	31	3,202	107	2,491	31	811	63	2,092	42	4,109

1/Data condensed from: An Inventory of the Ponds, Lakes and Reservoirs of Massachusetts, Berkshire and Franklin Counties by McCann, James A. and Leo M. Daly, Publication No. 10-2, published by Water Resources Research Center, University of Massachusetts at Amherst, Massachusetts.

Table 9-5 Summary of Native and Stocked Trout Streams2/

Number of Streams and Rivers	Total Miles of Streams and Rivers	Total Miles of Native and Stocked Trout Stream	Streams which Support Native Brook Trout: Number	Miles	Streams which Support Native Brown Trout: Number	Miles	Streams which are Stocked Annually with Trout: Number	Miles
206	430	428	194	374	43	191	58	182

2/Data provided by the Massachusetts Division of Fisheries and Wildlife.

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MASSACHUSETTS WATER RESOURCES STUDY - BERKSHIRE REGION

Table 9-4 Summary of the Ponds, Lakes and Reservoirs 1/

Number of Ponds, Lakes and Reservoirs	Total Acres Surface Water	Fishery Type Number of Ponds and Total Acres				Ponds, Lakes, or Reservoirs used exclusively for drinking water		Artificial Ponds or Reservoirs		Ponds with Public Access Available	
		Cold Water		Warm Water							
		(no.)	(ac.)	(no.)	(ac.)	(no.)	(ac.)	(no.)	(ac.)	(no.)	(ac.)
139	5,718	31	3,202	107	2,491	31	811	63	2,092	42	4,109

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Number of Streams and Rivers	Total Miles of Streams and Rivers	Total Miles of Native and Stocked Trout Stream	Streams which Support Native Brook Trout		Streams which Support Native Brown Trout		Streams which are Stocked Annually with Trout	
			Number	Miles	Number	Miles	Number	Miles
206	430	428	194	374	43	191	58	182

2/Data provided by the Massachusetts Division of Fisheries and Wildlife.

several acres and have been stocked with either warm or cold water fish species, depending on pond depth and summer water temperatures. These ponds support an estimated 7,900 recreation fishing user-days per year. Although privately owned and managed, the use of these ponds reduces the fishing pressure on public waters.

About ten ponds are constructed each year with SCS assistance. Construction of private ponds is expected to continue at about the same pace in the future.

Table 9-6 displays the number of user-days of quality fishing which can be expected from the streams and ponds in the region. The data assumes each fishing user-day to remove 0.2 pound of fish from the existing supply.

Outstanding or Unusual Fisheries Resources

Onota Lake--The lake provides exceptional habitat for Kokanee salmon, brown trout, northern pike and American smelt.

The Kokanee salmon is the landlocked version of the anadromous Sockeye salmon of the Pacific coast. Onota Lake is one of two bodies of water in the Commonwealth where this species has been introduced and where this species may be legally possessed. Kokanee are doing well in Onota Lake, are known to spawn there, but no natural reproduction has yet been found.

Exceptionally large brown trout have been caught in Onota Lake. Specimens in excess of ten pounds have been taken.

Exceptionally large northern pike have been caught in Onota Lake. Specimens in excess of 15 pounds have been caught. The New England record for a northern pike (26 lbs.,10 oz.) was taken from Onota Lake on February 16, 1975.

MASSACHUSETTS WATER RESOURCES STUDY - BERKSHIRE REGION
TABLE 9-6: EXISTING & PLANNEO FISHING ACTIVITY-OAYS

Water Type with & without public access	Total surface Acres or Surface Miles	Estimated Pounds of Harvestable Fish per Acre or Mile (pounds)	Pounds per Activity-Oay (pounds)	Estimated Recreational Fishing Activity-Oays Available (Activity-Oays)	Remarks
Water Type - with public access					
Ponds and Lakes	4,019 acres	21	0.2	422,000	Ooes not include stocked fish
Streams	308 miles	10	0.2	15,400	Ooes not include stocked fish
Stocked Fish (pounds)	--	--	0.2	125,000	Assuming 50% of 50,000 lbs. stocked is caught.
		TOTAL:	Existing supply	562,400	Available to the public.
Planned Additions					
3 lakes in the Washington Mountain Brook Watershed	325	21	0.2	34,100	Project authorized and under construction.
		TOTAL: Existing & Planned Supply		596,500	Future "Without a Plan" Condition
Water Type - without public access					
Ponds and lakes	1,699 acres	21	0.2	178,400	Fishery on these water bodies alleviates some fishing pressure on water with public access.
Streams	97 miles	10	0.2	4,900	
Private "Farm" ponds	75 acres	21	0.2	7,900	Alleviates fishing pressure in waters with access.
	TOTAL: Without Public Access			191,200	
	GRANO TOTAL: Regional Potential Supply			787,700	

There is a naturally reproducing population of American smelt in the lake. This species is a preferred forage fish of the brown trout and other predaceous fish species.

Laurel Lake--is an exceptional cold and warm water fishing lake. This lake is particularly good fishing for chain pickerel and brown trout. Brown trout in excess of 13 pounds have been captured and released during fishery sampling by the Massachusetts Division of Fisheries and Wildlife.

Kokanee salmon have been introduced into Laurel Lake and indications are that they are doing very well. Sport fishing for this species was first permitted in Laurel Lake during the 1976 trout season.

Southwest Branch of the Housatonic River

This is an exceptionally good natural brown trout fishery in the river at Pittsfield.

Green River

The Green River in Great Barrington has an exceptionally good natural brown trout fishery. Rainbow trout are known to "carry over" from one year to the next in this river. Carry over of rainbow trout is unusual in Massachusetts. No natural reproduction of rainbows has been found.

North Branch of the Hoosic River

There is an exceptionally good natural brown trout fishery in the river.

Cheshire Reservoir

There is an exceptionally good northern pike fishery in this reservoir.

9.3 Problems & Objectives

To maintain a quality environment in the Berkshire Region, it is desirable that a variety of wildlife be present for people to see, study, use and enjoy.

There is presently sufficient acreage and diversity of habitat to meet the needs of a wide variety of wildlife species. Increased public interest in nonconsumptive wildlife uses is expected to occur. On a regionwide basis, sufficient land area is presently available for hunting small game, but some popular hunting areas for small game and deer are becoming crowded. When outdoor recreational activities become crowded, less rewarding, and more competitive, the quality of the recreational experience declines and the public enthusiasm for the activity begins to wane. The percentage of the region's population which participates in deer hunting is expected to decrease as the population increases, although the total number of deer hunters is expected to continue to slowly increase.

Some wildlife habitat, especially that habitat available for game species, is gradually decreasing in the region as demonstrated by the reduction of the white-tailed deer range. Continued reduction of wildlife habitat acreage is expected, making it all the more important that particularly valuable habitats be protected and maintained and that other primary land uses (agricultural, forestland) be managed in a manner that also benefits wildlife.

The availability of wildlife habitat in North America has largely been the consequence or result of the use of land for a primary purpose other than wildlife. Land uses are usually determined by economic considerations of the owner. Even though wildlife has historically received a secondary or lower consideration in land use, some species have fared very well, while other less adapted species have been greatly reduced in number or have completely vanished from former portions of their range.

Fishery resources are also an important part of a quality environment. Increased public interest in fishing is expected to occur. Many of the more popular and easily accessible areas will become crowded. As with the hunting experience, when fishing areas become crowded and less rewarding, the quality of the experience diminishes. Existing access to nonpublic lakes, ponds, and streams is likely to decrease with increased posting of private land.

The objective for this chapter is to maintain and/or improve fish and wildlife resources of the region.

Specific components of this objective include:

1. provision of sufficient quantities of fishery resources to provide a quality sport fishing experience and harvest, consistent with conservation of the resource

2. provision of sufficient quantities of wildlife resources to provide quality consumptive and nonconsumptive use, consistent with conservation of the resource

3. protection and enhancement of the outstanding or unusual fish and wildlife resources for the enjoyment and benefit of people.

9.4 Needs

Fishery Resources

In order to provide a quality fishing experience, it is necessary that sufficient areas be available to permit uncrowded fishing, that there be a reasonable chance of catching fish, and that the fishery resource be protected for future users. Protection of this resource starts with maintenance of good water quality where it exists and improvement of water quality for areas of below standard conditions. See Chapter 7, Water Quality.

The real needs lie in the area of providing a reasonable expectation of catching fish while, at the same time, protecting the fishery resource from overfishing.

Estimated 1990 population in the region is 161,500. If present predictions prevail, about 28 percent of these people will fish and each angler will fish about 13.8 days per year. Estimated 1990 recreation demand for fishing is expected to reach about 625,000 user-days. As indicated in Table 9-6, present and projected fishery resources are capable of providing only 596,500 user-days of quality fishing, leaving an unmet need for about 28,500 user-days of fishing demand.

Wildlife Resources

Most hunting demands are being met with little or no adverse effect on the wildlife resources. Good wildlife management techniques, coupled with stocking programs, where required, have resulted in sustained annual harvests and a healthy wildlife population.

It is expected that the region could meet wildlife needs through 1990, if present habitat conditions remained the same. However, the Berkshire Region is gradually gaining urban and forest acreage and losing agricultural and open land. This trend will result in extensive unbroken forest areas which will tend to reduce variety in wildlife. In addition, the Berkshire forestland will continue to mature; a condition which will increasingly favor those species of wildlife which prefer the mature forest habitat.

The most pressing need in the wildlife resources area is to insure a diversity of land use and vegetative cover to encourage a variety of wildlife types. Protection of land as wildlife habitat in the region likely will continue to be subordinate to the use of land for a primary purpose, usually other than wildlife. Specific measures will need to be implemented to ensure a place for wildlife as land use in the region changes.

Decreasing public access to wildlife areas will continue to be a problem in the future. There is a need for a mix of programs to insure public access for viewing, studying and harvesting wildlife.

Forest Wildlife Resources

Wildlife abundance is related to forest stand structure, size classes and interspersed vegetative types. A variety of conditions increase their chances for survival. For any given ownership, the following management systems are ideal for most wildlife.1/

1/SOURCE: USDA, Forest Service, "Managing Woodlands for Wildlife", 1970.

Stand Structure

--75% using even-aged cutting methods for emergence of lush vegetation which will later develop into park-like stands with maximum visibility. Cutting units should be small (2 to 20 acres) and well scattered.

--25% using uneven aged methods to create variety and an interspersion of different vegetative types.

Size Classes

--25% in seedling-sapling stands for food and nesting cover.
--25% in pole stands for good visibility and easy access during loafing hours.
--50% in sawtimber-sized trees for maximum yields of acorns, beechnuts and hickory nuts for wildlife food.

Table 9-7 provides comparative judgements on wildlife food and cover for these size classes.

Interspersed Vegetative Types

--3% in permanent grass--legume food plots.
--5% in permanent openings maintained to encourage early succession, native vegetation.
--10% in small (2 to 5 acres) conifer patches or other evergreen cover to provide shelter during adverse weather.

9.5 Alternatives

Fishery Resources

It appears there will be increasing demands for quality sport fishing in the Berkshire Region, and there are several alternatives which will serve to equalize demand and resource capability to meet this demand.

Stream fishing provides a limited number of user-days based on sustained annual harvest. There are 97 miles of streams in the region that do not have public access. If access were acquired to

MASSACHUSETTS WATER RESOURCES STUDY - BERKSHIRE REGION

Table 9-7 - Availability of Wildlife Food and Cover
Based on Stages of Forest Vegetation

Wildlife Food and Cover Types	Transition Stages			
	During Harvest (1 year)	Seedling & Saplings (1-10 Years)	Polesized (10-35 Years)	Sawtimber (35-100 Years)
Herbaceous Forage	More	More	Less	More
Browse	More	More	Less	More
Tree Mast	Less	Less	More	More
Understory Mast	More	More	Less	More
Overstory Canopy	Less	More	More	Less
Ground Cover	More	More	Less	More
Den Trees	Less	Less	More	More

SOURCE: School of Forest Resources, College of Agriculture, Pennsylvania State University, "Clearcutting in Pennsylvania", 1975.

all of these streams, available user-days could be increased by 4,900. Several streams in the region have potential for exceptional sport fishing if public access were obtained. Access could be obtained by purchase or lease by the Division of Fisheries and Wildlife or by donation of conservation easements to towns.

1. The following streams are recommended for early acquisition of public access.

Stream	Town
Green River	Alford - Great Barrington
Konkapot River	Monterey - New Marlborough
Ironworks Brook	Sheffield
Williams River	West Stockbridge
Karner Brook	Egremont
Sackett Brook	Pittsfield
Umpachene Brook	New Marlborough

These streams will provide an additional 41 miles or 2,050 Activity-Days per year.

As indicated in Table 9-6, an additional 178,400 Activity-Days would be available on ponds and lakes in the region if restrictions on public access could be removed. As only 28,500 additional Activity-Days are needed to meet 1990 needs, the present supply of surface waters can easily meet these needs.

2. Acquire public access to one or more of the following ponds and lakes:

Pond/Lake	Town	Acres	Potential Activity-Days
Mill Pond	Sheffield	107	11,200
Plantain Pond	Mount Washington	61	6,400
Stevens Pond	Monterey	30	3,200
Harnet Pond	New Marlborough	32	3,400
Cheshire Reservoir	Cheshire, Lanesborough	418	43,900

Most of these nonaccess ponds and lakes are privately owned and access would require negotiation of public use agreement or acquisition of water rights as well as development of access facilities.

Financial assistance to provide public access to water areas is available to towns and cities in the region from the following sources:

(1) Bureau of Outdoor Recreation, U. S. Department of the Interior through the Soil and Water Conservation Fund
(2) Massachusetts Department of Environmental Management, Division of Conservation Services through the Self-Help Program.
(3) Berkshire-Franklin Resource Conservation and Development Program administered by the Soil Conservation Service, U. S. Department of Agriculture.

Financial assistance is available to the Massachusetts Division of Fisheries and Wildlife and the Massachusetts Department of Environmental Management for providing public access to water areas or the acquisition and development of fishing waters from the following sources:

(1) Federal Aid in Fish Restoration. Funds for this program come from a federal 10 percent excise tax on sport fishing equipment. The Massachusetts Division of Fisheries and Wildlife administers the use of money from this source.

(2) Berkshire-Franklin Resource Conservation and Development Program.
(3) Public Access Fund. Money for this fund is derived from a small portion of the state gasoline tax, administered by the Public Access Board. This source of funds is presently being used to provide public access to Onota Lake.

<u>There are opportunities to provide additional fishing, which will be mentioned here but are not presented as alternatives.</u>

There are about 811 acres of surface waters located in reservoirs which are used for municipal drinking water supply. Present health regulations prohibit the use of these reservoirs for other purposes. If water supply reservoirs were to be opened to fishing, an additional 85,200 user-days of fishing recreation could be obtained.

As a first step toward the utilization of fishery resources in water supplies, the Division of Fisheries and Wildlife, the Division of Water Supply, the Division of Water Resources, and individual towns could cooperate in establishing a carefully controlled and monitored test fishing program in selected reservoirs.

Cleveland Reservoir, a 145-acre water supply reservoir for Pittsfield, could be considered for a carefully controlled and monitored test fishing program. This program will need the cooperation of the Division of Fisheries and Wildlife, the Division of Environmental Health, and the Division of Water Resources. The reservoir could supply 15,200 user-days of fishing per year.

There is presently a "Fish for Fun" program at Windsor Reservoir, a water supply for Dalton. Under this "Fish for Fun" format, a fisherman is required to return healthy fish to the water. One injured fish may be kept, but the angler must stop fishing for that day. More examples of controlled fishing and recreation which do not create unacceptable hazards to municipal water supplies would be desirable in the region.

There are a number of potential reservoir sites in the Berkshire Region that could be developed as new fishing areas.

Appendix B, Evaluation of Potential Reservoir Sites, indicates 38 sites which appear to have good potential for development as quality fishing pools. These sites could be developed privately or by a governmental agency. It is to be expected that the loss of any stream fisheries must be weighed against the development of any lake fishery during a detailed project assessment.

Technical assistance and financial cost-sharing is available through the Berkshire Franklin RC&D Project to establish water-based recreation facilities in the project area. These recreation areas can provide good fishing areas in addition to benefits from other uses.

Water areas for recreational fishing and other uses can often be obtained by including multiple use when planning floodwater storage impoundments. Flood prevention programs are administered by the Massachusetts Water Resources Commission, the USDA, the Soil Conservation Service, and the Army Corps of Engineers.

Many landowners in the region have constructed ponds on their property for personal recreation use. Although privately managed, the use of these ponds reduces the fishing pressure on public waters. Technical assistance on the construction of ponds is available from the Soil Conservation Service, through the Berkshire Conservation District.

In densely populated Massachusetts, heavy fishing pressure makes it impossible for the natural fishery resources to meet demand. A program of stocking fish is essential to supplement native fish. The Massachusetts Division of Fisheries and Wildlife raise trout in hatcheries and stock them in waters throughout the state. Although fish stocking is an artificial means of meeting fishing demands, it has proved highly successful. At present, stocked trout provide about 125,000 user-days of fishing recreation per year. This estimate is based on the assumption that 50 percent of the 50,000 pounds stocked annually in the region are caught.

A consistent, long-range public education program needs to be established by the Division of Fisheries and Wildlife to attempt to develop a sporting attitude toward fishing and to encourage warm water fisheries. Good public attitudes toward sport fishing could undoubtedly be improved by establishing positions for conservation

educators in the Information and Education Section of the Division of Fisheries and Wildlife. These educators could visit the public schools of the Commonwealth and present informative and interesting programs on fisheries and wildlife biology and management to students. It is largely during a person's early school years that attitudes are formed. If wildlife appreciation, habitat relationships, the legitimacy of renewable resource utilization and the sporting ethic are to be understood, then the school age children are the people to reach first.

Older sportsmen and others can be reached through a continuing series of articles in "Massachusetts Wildlife" to stress the sport attributes and other benefits of fishing and fishery management.

Innovative programs should be implemented on a test basis to develop wider benefits of the present "put-and-take" trout program in the state.

Some programs which appear to show promise include:

1. More areas where trout are stocked with a low daily creel limit but unlimited catch and return privileges.

2. Introduction of a trout stamp as an adjunct to the present license fee to raise funds for an increased fisheries program. A trout stamp would be required for an angler to legally keep a trout.

3. Extend stocking by making more releases in smaller numbers over longer time spans.

4. Gradual expansion of the "Fishing for Fun" concept. This approach is particularly suited to ponds capable of supporting and carrying over trout. Regulations requiring either all trout being returned to the water or permitting the keeping of only one fish would result in recycling of fish and an

increased user-day benefits and a quality fishing experience. The "Fishing for Fun" Program has been introduced at Windsor Reservoir.

5. A concentrated education campaign in "Massachusetts Wildlife" to convince the angler that there are other good sport species of fish besides trout in Massachusetts waters. The warm water fishery in the state is presently underutilized and can stand additional pressure. Increased interest in warm water fishing may reduce some pressure on the trout fishery.

6. There is room for diverse programs and exotic species management; i.e., walleye pike, muskellunge, northern pike, and Kokanee salmon. Not that large numbers of such species would be supplied, but that anglers have an opportunity to catch one of this type in Massachusetts.

Wildlife Resources

The alternatives in managing wildlife resources in the Berkshire Region are primarily concerned with guiding or altering land use and with providing public access to wildlife areas. Nonconsumptive uses of wildlife such as nature study and photography will also frequently benefit from a good management program for consumptive use. If wildlife resources are available in sufficient quantities to hunt, they will also be able to provide good bird-watching and nature study opportunities. Likewise, if wildlife areas remain open to hunting, they will undoubtedly be available for year-round nonconsumptive uses.

Some of the more specific wildlife resource alternatives are outlined below:

3. Promote forest management practices which provide a diversity of wildlife habitat.

3.1 Promote the harvesting of mature timber stands to the extent that the volume annually harvested is equal to the volume annually produced. At the present time, annual growth volume exceeds annual harvest resulting in a trend towards mature and overmature woodland with little wildlife habitat diversity.

Wildlife abundance is related to the diversity within forest stands. Timber harvesting helps create variety and an interspersion of different vegetative types which is ideal for most forest-game species. These diverse woodland conditions favor emergence of lush regrowth, sawtimber-sized trees for acorns and nuts, establishment of permanent grass-legume food plots and protection of conifer areas to provide shelter during adverse weather. (See alternatives - Chapter 3, Land Use)

3.2 Establish a regionwide policy concerning the leaving or even encouragement of den trees for wildlife. There are about 35 to 40 species of birds and mammals which use den trees. One shortcoming of our present forests is the lack of den trees.

3.3 Some public education in the view of forests as multiple use renewable resources is also needed.

3.4 Encouraging wood-using industries to locate in the region, especially those industries which can economically utilize low quality timber of various size classes would be desirable since these industries would be able to make use of a presently underutilized resource.

The Berkshire-Franklin Resource Conservation and Development (RC&D) Project has several proposals for project measure plans

to utilize forest products. Among these are a feasibility study for a post and pole treatment plant; a marketing study to identify specialized needs for an industrial grade plywood plant; a study to determine feasibility for establishment of a wood fiber complex industry; and feasibility investigations for a wood veneer mill. Any one of these proposals could lead to a wood-using industry which would utilize forest resources and, at the same time, improve wildlife habitat in maturing woodlands.

3.5 Encourage small block (25 acres or less) clear cutting on selected sites where the forest stand is even aged. This could be accomplished on state forestland where wildlife interest is primary.1/ This program could be accomplished through the services provided by the service foresters of the Massachusetts Division of Forests and Parks.

For private woodland owners, federal cost sharing is available under the ACP Program administered by the Agricultural Stabilization and Conservation Service (ASCS). This includes wildlife practices on forestland that provide or improve wildlife habitat. Writing these practices into forest management plans should be encouraged by a joint cooperative effort of the service forester and the district conservationist of the Soil Conservation Service.

Small block, clear cutting can be established on a demonstration basis in the Beartown, October Mountain, and Pittsfield State Forests. The purpose of the programs should be well publicized to avoid potential adverse public comment.

4. Encourage private landowners to provide wildlife habitat and public access to that habitat.

4.1 Encourage private landowners to maintain open fields even though the fields are no longer producing an agricultural crop. Scheduled mowing is adequate to keep fields open and is of

1/The Massachusetts Division of Fisheries and Wildlife already maintains some areas (i.e., the Wildlife Management Area on the Freetown-Fall River State Forest).

particular benefit to openland wildlife and white-tailed deer. Cost sharing for mowing is provided by the U. S. Department of Agriculture, Agricultural Stabilization and Conservation Service. This is available to provide landowners an incentive to keep previously productive agricultural fields in an open condition for wildlife benefit.

4.2 Establish the legal framework whereby landowners are paid a fee or allowed reduced land taxes if they allow public entry (number to enter may be limited) for one or several outdoor recreation activities. An experimental program conducted in several other states by state fish and game agencies and the U. S. Department of Agriculture, involved making cash payment to agricultural producers in return for public access privileges for hunting. A method of controlling hunter density was devised by personnel of the state fish and game agency wherein parking areas were established which deliberately limited the number of automobiles (and, thus, hunters). This program proved to be very successful in the states where it was tested. A similar program might be of value in Massachusetts.

5. Acquire and manage additional wildlife land.

5.1 Acquire and bring under management additional open land north, south or east of the Stafford Hill Wildlife Management Area (town of Cheshire), to provide a larger land area for hunting and visual enjoyment of pheasant and other farm-game species.

This area, if enlarged, would better meet the open land wildlife needs of the people of Adams, North Adams and Cheshire.

5.2 Another area which deserves consideration for open land wildlife habitat protection and management is the land bordering each side of the Hoosic River between Adams and North Adams. This area

contains oxbow ponds, shallow marshes and open grass and herbaceous cover. Public use would primarily involve non-consumptive wildlife associated activities. Pheasant stocking and hunting may be practical in the more rural south portion of the 400-acre area.

5.3 Acquire river bottomland and lands within the regionally important wetlands and manage them for wildlife. (See Chapter 6, Wetlands.)

6. Protect, preserve, and enhance outstanding or unusual wildlife resources.

6.1 Acquire and protect from development the bogs in the region where the rare bog turtle is known to occur. Acquisition might be either state, municipal or private conservation organization.

6.2 Initiate a study to inventory the limestone caves in the region and determine which caves are of importance to the endangered Indiana bat. When identified, the caves and land immediately surrounding them could be scheduled for public acquisition and protection.

6.3 Expand the wild turkey establishment program. Wild turkey have been released in the town of Mount Washington. Additional turkey releases into suitable covers elsewhere in the region is encouraged in hopes of reestablishing this species.

CHAPTER 10 - RECREATION

10.1 SUMMARY

A wide range of recreational activities is available to visitors and residents of the Berkshire Region. This typically New England region has outdoor recreational opportunities suitable for each of its four well defined seasons.

By 1990, there will be insufficient facilities to meet demands for the four outdoor recreation activities studied in detail: camping, picnicking, swimming and boating. In addition, the region has numerous unique natural features which should be preserved for future generations.

10.2 Resource Base and Existing Programs

In Massachusetts the Berkshire Region is second only to the Cape Cod Region as an outdoor recreation center. Vacation estates and summer homes are increasing in number throughout the region and vacationers, especially in summer, contribute an ever increasing amount to the total economy. Mountain scenery, unique or unusual natural areas, recreational opportunities, historic and cultural attractions, and a rural setting combine to create a vacation paradise for today's suburban and urban populace. Close proximity to urban centers makes the Berkshire Region available to a large segment of the population of the northeast. Table 10-1 lists the distances from major northeast cities to Pittsfield which is the most central and largest city in the Berkshire Region. Approximately 20 million people reside within only five hours automobile travel time of the Berkshires.

Summer recreation opportunities in the region include boating, fishing, swimming, hiking, picnicking, nature study, golfing, horseback riding, and camping. In fall, pleasure driving, hiking and hunting are the most common recreational pursuits. In winter, downhill skiing, cross country skiing, snowmobiling, snowshoeing, ice skating, and ice fishing are the leading recreational activities. During spring, the trout fisherman dominates the outdoor scene. Natural populations of brook and brown trout are common in many of the streams in the region.

In addition, the Massachusetts Division of Fisheries and Wildlife stock trout in the larger streams which receive heavy fishing pressure. See Chapter 9, Fish and Wildlife for more detail on the fisheries resource.

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Table 10-1

Distances from Major Cities to Pittsfield

	Miles
Albany, New York	37
Springfield, Massachusetts	54
Hartford, Connecticut	70
Providence, Rhode Island	130
Boston, Massachusetts	140
Concord, New Hampshire	142
New York, New York	144
Burlington, Vermont	157
Portland, Maine	227
Philadelphia, Pennsylvania	236

Although about 80 percent of the region is sparsely populated, the population of the remaining 20 percent, together with seasonal residents and an influx of recreationists combine to create demand for recreation which exceeds the available supply.

The recreation acreage found in the Berkshire Region is summarized in Table 10-2. The total acreage of 89,764 acres represents approximately 20 percent of the Berkshire Region. State forest and park lands account for 68 percent of the total available recreation land. Other ownership categories include 5 percent municipal, 27 percent private and less than 1 percent federal. The municipal recreation land includes: town forests, town parks and recreation areas, conservation commission lands and major municipal school sites. The present distribution of public and private recreation facilities in the region is shown on Figure 10-1.

State and Federal Lands

Within the region there are 11 major state owned and operated units: state forests, parks and reservations. These holdings total more than 58,000 acres of land and provide a wide variety of recreational activities for public use. Table 10-3 summarizes these properties, their acreage, location, and available recreation activities. The only federal land in the region, which can be classified as recreation land, is the 180-acre Hartsville Fish Hatchery operated by the U.S. Fish and Wildlife Service, in New Marlborough.

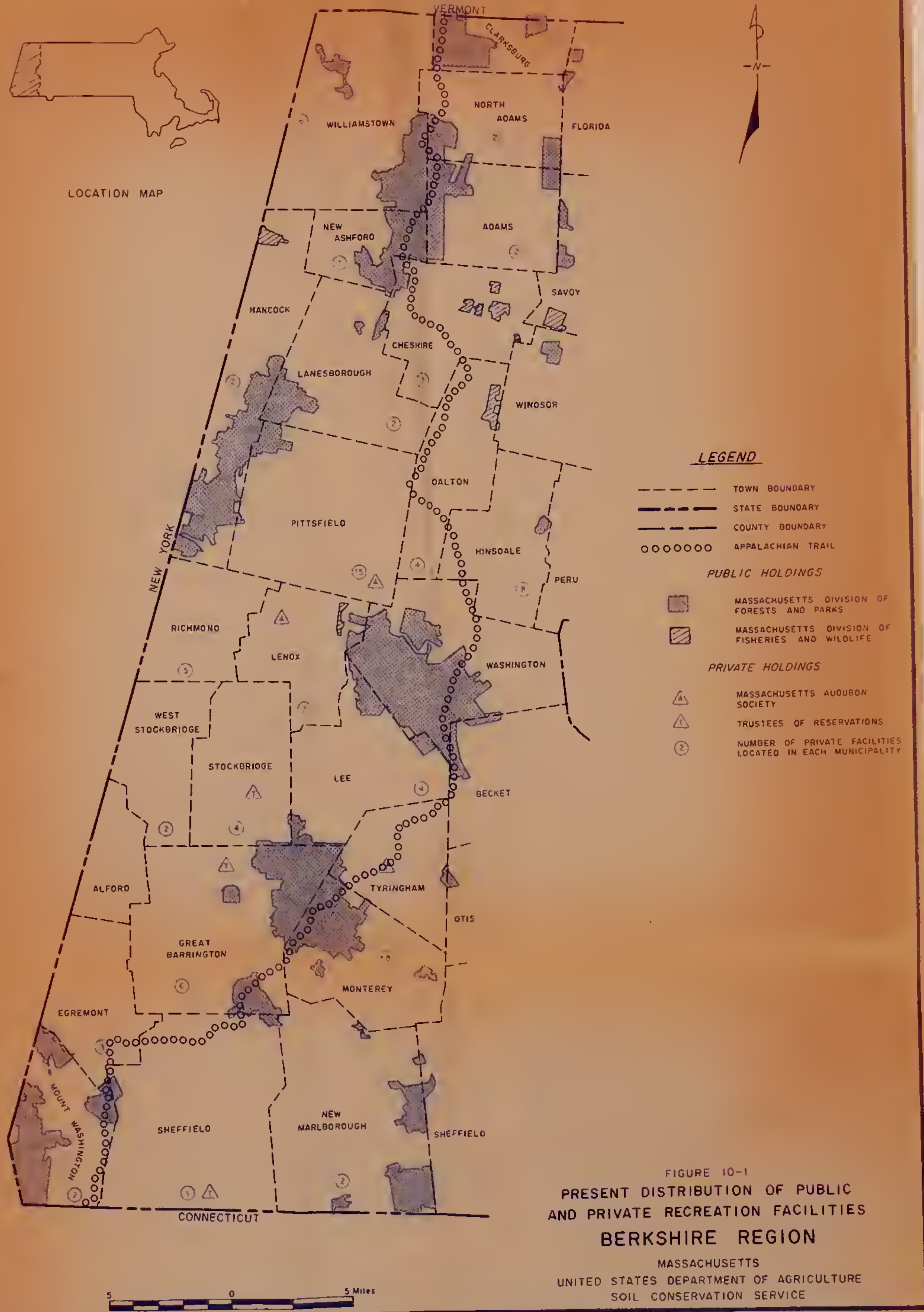

FIGURE 10-1
PRESENT DISTRIBUTION OF PUBLIC AND PRIVATE RECREATION FACILITIES
BERKSHIRE REGION
MASSACHUSETTS
UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Privately Owned and Operated Recreation Lands

Lands in this category include those owned by nonprofit conservation organizations and by private commercial or noncommercial recreational enterprises.

MASSACHUSETTS WATER RESOURCES STUDY - BERKSHIRE REGION

Table 10-2 - Recreation Acreage

Municipality	Federal Acres	State Acres	Municipality Acres	Private Acres	Total Acres
Adams	-	3,300	29	70	3,399
Alford	-	-	5	160	165
Cheshire	-	565	10	1,165	1,740
Clarksburg	-	3,274	20	40	3,334
Dalton	-	489	244	2,154	2,422
Egremont	-	-	171	1,755	1,926
Great Barrington	-	7,137	320	2,022	9,479
Hancock	-	6,588	42	728	7,358
Hinsdale	-	303	15	797	1,115
Lanesborough	-	1,834	15	446	2,295
Lee	-	1,555	170	551	2,276
Lenox	-	667	678	1,717	3,062
Monterey	-	4,763	30	771	5,564
Mount Washington	-	4,695	-	1,375	6,070
New Ashford	-	3,719	-	2,300	6,019
New Marlborough	180	3,021	10	976	4,187
North Adams	-	1,487	357	16	1,860
Pittsfield	-	1,576	1,238	1,630	4,512
Richmond	-	-	5	221	226
Sheffield	-	313	149	181	643
Stockbridge	-	28	331	595	954
Tyringham	-	363	6	222	591
Washington	-	11,947	7	300	12,254
West Stockbridge	-	-	212	109	321
Williamstown	-	3,156	857	3,582	7,595
Regional Total	180	60,780	4,921	23,883	89,764

Sources: 1. Current Supply of All Outdoor Recreation Sites, Advance Draft, Massachusetts Department of Natural Resources, October 1971.
2. Update by USDA personnel - 1975.

MASSACHUSETTS WATER RESOURCES STUDY
BERKSHIRE REGION
Table 10-3
Major State Forests, Parks and Reservations

Area	Location	Acreage	Total Recreation Trail Length Miles	Activities Available: Swimming	Boating	Fishing	Hiking	Picnicking	Camp sites	Hunting	Snowmobiling	Skiing
Bashbish Falls S.F.	Mt. Washington	3,679	10			x	x			x	x	
Beartown S.F. and Swann S.F.	Lee, Monterey, Stockbridge, Tyringham, Great Barrington	10,470	39	x	x	x	x	x	50	x	x	
Clarksburg S.F.	Clarksburg	2,906	8			x	x			x	x	
Cookson S.F.	New Marlborough, Sandisfield	2,378	15			x	x			x	x	
East Mountain S.F.	Great Barrington, Sheffield, New Marlborough	1,875	5				x			x	x	x
October Mountain S.F.	Becket, Lee, Lenox, Washington	15,711	35		x	x	x		50	x	x	
Pittsfield S.F. Bates Memorial, S.P. & Shaker Memorial, S.P.	Hancock, Lanesborough, Pittsfield	9,404	37	x	x	x	x	x	25	x	x	
Mt. Everett S. R.	Mt. Washington, Sheffield	1,141	4				x			x	x	
Mt. Greylock S.R.	Adams, Lanesborough New Ashford, No. Adams, Williamstown	10,376	32			x	x	x	50	x	x	
Clarksburg S.P.	Clarksburg	368	2	x	x	x	x	x	48	x	x	
Taconic Trail S.P.	Williamstown	558	10				x			x	x	
Totals		58,866	197						223			

1/ Data condensed from Guide to Massachusetts Campgrounds and Recreation Areas, published by the Commonwealth of Massachusetts, and Massachusetts Outdoor Recreation Plan, prepared by the Massachusetts Department of Natural Resources, January 1973, and communication with personnel of the Department of Environmental Management, Region 5, Pittsfield, Massachusetts.

2/ S.F. - State Forest, S.P. - State Park, and S.R. - State Reservation.

The nonprofit conservation organizations include the Trustees of Reservations, Massachusetts Audubon Society and the Berkshire County Land Trust and Conservation Fund. The Trustees of Reservations was established "to preserve for the public, places of natural beauty and historic interest within the Commonwealth of Massachusetts."1/ The Massachusetts Audubon Society and the Berkshire County Land Trust and Conservation Fund have similar objectives. Recreation provided on their properties is largely of the passive type consisting of hiking, nature study and interpretation, picnicking, and the enjoyment of scenic vistas. Table 10-4 summarizes the location and use of the Trustees of Reservations and the Massachusetts Audubon Society lands in the Berkshire Region.

There are 86 privately owned and operated commercial or noncommercial recreational enterprises in the region. These enterprises include golf clubs, ski areas, camping areas, recreation resorts, and day use recreational areas. The combined acreage of these facilities totals nearly 17,000 acres. Table 10-5 presents a summary of the private recreation facilities and activities available in each town.

Although privately owned and operated recreational facilities operate on less than one-third as much land as is available on public lands, they contribute more than this percentage of the total supply of available outdoor recreation. This comparison may be misleading, however, because the public lands were acquired for other public purposes in addition to recreation. Private recreation developments are generally intensely managed and require high occupancy or use in order to maintain economic viability.

Hiking Trails

As indicated in Table 10-3, Major State Forests, Parks and Reservations, hiking is available at all eleven areas listed. The 75-mile Massachusetts portion of the 2,000-mile Appalachian Trail is located entirely within Berkshire County and all but three miles are within the region. Six state forests or reservations are transected by this trail. In all, about 28 miles of the trail are on state lands.

1/ The Trustees of Reservations, A Bulletin of News Comment and Opinion in the Field of the Environment, Milton, Massachusetts, March 1972.

The region has two other established trails, the 26-mile Taconic Crest Trail and the 23-mile Taconic Skyline Trail. The Taconic Crest Trail is shared with New York State, while the Taconic Skyline Trail is entirely within the region.

There are two connector trails being planned by the Massachusetts Division of Forests and Parks and others. These proposed trails will connect the Appalachian Trail with the Metacomet-Monadnock Trail in the Connecticut River Valley and other trails east of the region and thus, establish a loop trail system in western Massachusetts which could be over 250 miles long.

Natural Areas

In 1971, the New England Natural Resources Center undertook a project to inventory the natural areas of New England. In Massachusetts this inventory was coordinated and supervised by the Trustees of Reservations and the Massachusetts Audubon Society with state assistance. The inventory was to "be on areas of land or water which retained to some degree their natural character, and which exhibited native plant and animal communities or rare or valuable individual members of such communities, or any other natural features of unique or unusual scientific, educational, geological, ecological, or scenic value."1/ Although recreational value was not identified as a value of natural areas they constitute a very real contribution to a variety of passive forms of recreation. In Massachusetts 461 natural areas have been inventoried and 54 are in the Berkshire Region.

Twenty-four (44 percent) of those within the region are publically owned, owned by a private conservation organization or are adequately protected by private interests. As presented in this inventory, thirty sites are partially or totally privately owned and are not considered "safe indefinitely." Nine of these thirty areas were selected because of historic, cultural or archeological features--in addition to their natural

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1/ Quote is taken from a booklet entitled, Natural Areas in New England, printed by the New England Natural Resources Center, 506 Statler Building, Boston, Massachusetts 02116.

MASSACHUSETTS WATER RESOURCES STUDY
BERKSHIRE REGION
Table 10-4
Holdings of Private Nonprofit Conservation Organizations

RESERVATION	TOWN	ACRES	ACTIVITIES AVAILABLE
TRUSTEES OF RESERVATIONS: 1/			
Bartholomew's Cobble	Sheffield	168	A National Natural Landmark, enjoyment of scenic vistas, nature study, bird watching, picnicking.
Mission House	Stockbridge	0.5	A National Historic Landmark.
Monument Mountain	Great Barrington	257	Enjoyment of scenic vistas, hiking, nature study, picnicking.
Naumkeag	Stockbridge	46	Historic site.
Tyringham Cobble	Tyringham	222	Enjoyment of scenic vistas, cross country skiing, hiking, picnicking, skiing, nature study, snowshoeing.
MASSACHUSETTS AUDUBON SOCIETY:			
Canoe Meadows	Pittsfield	230	Nature study and interpretation.
Pleasant Valley Wildlife Sanctuary	Lenox	740	Hiking, nature study and interpretation, picnicking.
TOTAL ACRES		1,633.5	

1/ Data taken from an informational brochure entitled: The Trustee of Reservations, Natural Areas, Historic Sites, published by the Trustees of Reservations, 224 Adams Street, Milton, Massachusetts.

aspects. The twenty-one remaining areas can be classified as follows: caves 8; wetlands, lakes and streams 6; and geologic or topographic 7. The New England Regional Commission, sponsors of this New England Natural Areas Project is now developing a regional plan to protect natural areas as major economic, ecologic and aesthetic assets. Mt. Greylock, Monument Mountain, Bashbish Falls, Bartholomew's Cobble, and Tanglewood are examples of the twenty-four natural areas which are considered "safe indefinately."

Scenic Rivers

Public Law 90-542, Wild and Scenic Rivers Act, established a national program to protect "certain selected rivers which possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic cultural or other similar values."1/

For Massachusetts, An Act Establishing a System of Scenic and Recreational Rivers and Streams in the Commonwealth, General Laws, Chapter 21, Section 17B, has been adopted to establish a state program comparable to the national program. Other states, New York for example, have passed similar legislation.

In the region certain streams or reaches of streams may qualify for inclusion in the state system. A set of criteria was developed to determine this. The criteria are:

1. Water Quality--presently or proposed Class "B"
2. Minimum Size of Drainage Area--5 square miles at upstream end and 10 square miles at downstream end
3. Minimum Stream Width--8 feet at upstream end and 15 feet at downstream end
4. Minimum Length--5 miles for good esthetic quality streams, could be less for outstanding esthetic quality streams
5. Adjacent Land Use--little urban development
6. Recreational and Scenic Values--present recreational potential and visual quality.

1/ Public Law 90-542, Section 1 b.

MASSACHUSETTS WATER RESOURCES STUDY

BERKSHIRE REGION

Table 10-5

Privately Owned and Operated Recreation Facilities[1/]

TOWN	TOTAL NUMBER OF RECREATIONAL FACILITIES	TOTAL ACRES	RECREATION ACTIVITIES AVAILABLE
Adams	2	70	Golfing, swimming, picnicking, fishing
Alford	0	0	-
Cheshire	3	329	Camping, archery, tennis, picnicking, fishing, hiking, swimming, boating
Clarksburg	1	40	Golfing
Dalton	4	367	Golfing, fishing, picnicking, swimming, natural and scenic area
Edgremont	3	1,225	Camping, fishing, picnicking, swimming, golfing, hunting, skiing, scenic area, hiking, rock hunting
Great Barrington	6	1,495	Hiking, swimming, golfing, tennis, bridle trails, camping, hunting, skiing.
Hancock	2	600	Fishing, tennis, camping, skiing, swimming, golfing.
Hinsdale	8	1,085	Camping, golfing, hiking, fishing, swimming
Lanesborough	2	347	Golfing, hiking, snowmobiling, tennis, picnicking swimming.
Lee	4	695	Picnicking, camping, fishing, hunting, swimming, golfing, skiing, hiking, tennis.
Lenox	3	2,080	Swimming, skiing, golfing, camping, tennis, hiking.
Monterey	8	818	Camping, tennis, hiking, swimming, fishing, picnicking.

1/ Data is condensed from field data collected by a joint federal and state agency team during the winter 1974. Inventory is referred to as the National Association of Conservation Districts Private Recreation Inventory.

MASSACHUSETTS WATER RESOURCES STUDY

BERKSHIRE REGION

Table 10-5 (Continued)

Privately Owned and Operated Recreation Facilities[1/]

TOWN	TOTAL NUMBER OF RECREATIONAL FACILITIES	TOTAL ACRES	RECREATION ACTIVITIES AVAILABLE
Mount Washington	2	1,400	Fishing, camping, hiking, swimming, tennis
New Ashford	1	1,000	Tennis, fishing, picnicking, skiing, swimming, hiking, camping.
New Marlborough	2	760	Camping, tennis, hiking, swimming
North Adams	2	17	Golfing, hiking
Pittsfield	15	1,504	Golfing, archery, tennis, fishing, boating, swimming, hiking, picnicking, gun ranges, camping, skiing
Richmond	5	345	Fishing, swimming, picnicking, hiking, tennis, camping, hunting.
Stockbridge	4	582	Boating, camping, golfing, natural area, hiking, fishing, swimming, archery, gun ranges, tennis
Sheffield	1	5	Tennis
Tyringham	0	0	-
Washington	0	0	-
West Stockbridge	2	253	Camping, tennis, swimming, hiking, fishing, golfing, scenic area
Williamstown	6	1,967	Golfing, skiing, tennis, hiking, natural area, camping, scenic area.
TOTAL	86	16,984	

1/ Data is condensed from field data collected by a joint federal and state agency team during the winter 1974. Inventory is referred to as the National Association of Conservation Districts Private Recreation Inventory.

The following streams have potential for inclusion in the state program:

1. Housatonic River, from Risingdale dam in Great Barrington to the Connecticut State Line (Approximately 24 miles long)
2. Williams River, from Massachusetts Turnpike bridge in West Stockbridge to confluence with the Housatonic River in Great Barrington (Approximately 10 miles long)
3. West Branch of the Green River (tributary to Hoosic River) to confluence with Green River and Green River from this confluence to Sweets Corner, Williamstown (Approximately 5 miles long).

Evaluation of Potential Reservoir Sites

The Massachusetts Division of Forests and Parks evaluated the potential reservoir sites, which were identified in the following reports: A Study of Potential Reservoir Sites, Housatonic Study Area, USDA, June 1969, and A Study of Potential Reservoir Sites in Massachusetts, Hudson River Basin, USDA, January 1968. This evaluation is presented in Appendix B, Evaluation of Potential Reservoir Sites, in the back of this report.

Eighty-seven potential reservoir sites were evaluated for swimming, picnicking, camping, boating, hiking and nature study on or adjacent to the site.

Existing Programs

Federal programs with assistance in recreation are:

1. Berkshire-Franklin Resource Conservation and Development (RC&D) Program which is a cooperative effort of USDA, Conservation Districts, Massachusetts Department of Environmental Management, Massachusetts Department of Fisheries, Wildlife and Recreational Vehicles, Berkshire County Regional Planning Commission and others. Both technical and financial assistance is available on RC&D projects, including: recreation projects which have community benefits and are sponsored by public bodies or local nonprofit organizations.
2. The Watershed Protection and Flood Prevention Program (Public Law 83-556), which is administered by SCS, can provide water-based recreation as a component of a PL 83-566 watershed project.

3. The Land and Water Conservation Fund, administered by the U.S. Department of the Interior's Bureau of Outdoor Recreation, provides cost sharing money to the state and to municipalities for acquisition and development of recreation land.

State recreation programs include:

1. The State Comprehensive Outdoor Recreation Plan (SCORP), financed by the U.S. Department of the Interior, Bureau of Outdoor Recreation and by the Commonwealth has just recently been revised by the Massachusetts Division of Conservation Services. The SCORP was first done in 1966 and has since been updated in 1971 and 1976.
2. The Massachusetts Self-Help Program, administered by the Massachusetts Division of Conservation Services, provides cost sharing money to cities and towns for acquisition of land purchased for conservation and passive recreation purposes.
3. The ongoing programs of the Massachusetts Division of Forests and Parks and the Massachusetts Division of Fisheries and Wildlife include management of state forests, parks, reservations, wildlife management areas, wildlife sanctuaries, and other state properties.

10.3 Problems and Objectives

The recreation objectives for the region are twofold:

1. provide recreational opportunity to meet the demand generated by visitors and residents of the region
2. provide unique natural and cultural features.

For the purposes of this study, we have analyzed supply and demand for these summer water-related recreation activities: camping, picnicking, swimming, and boating.

The region also has tremendous appeal to the winter outdoor recreation enthusiast. The five larger ski areas with chair lifts and the four year-round resort hotels with skiing facilities should continue to adequately

meet the demand for downhill skiing. These areas are all privately operated and it is expected that the private sector will adjust to any increases in future demand. Other winter outdoor recreation activities will not be discussed here except to mention snowmobiling. The eleven major state forests, parks and reservations, listed in Table 10-3, all have snowmobiling areas. In addition, much snowmobiling is done on private lands and particularly on powerline and other similar rights-of-way.

The 1976 SCORP report states as a policy that "The statewide imbalance between the supply of and demand for recreation facilities must be redressed by site acquisition and development and by special programs designed to meet urban demand."1/ The demand studies done for the 1976 SCORP indicate that there is a high latent demand in the urban centers for certain outdoor recreation activities which appear to be unfulfilled because of lack of transportation. The recreational facilities of the Berkshire Region could be more accessible to inner city residents if transportation was made available.

10.4 Needs

Table 10-6, Present and Projected Needs for Four Recreation Activities, was developed for the 25-municipality Berkshire Region. Comparison with the 1971 and 1976 SCORP report figures, which were developed for the 32-municipality Berkshire County, indicates the same general conclusions.

The Activity Day figures can be converted to acres or sites needed as follows:

Activity	Units	1970 Needs	1990 Needs	2010 Needs
Camping	Camp sites	-	480	1,160
Picnicking	Picnic sites	230	750	1,390
Swimming	Linear feet of beach	7,300	9,300	11,700
Boating	Surface acres with access ramps	3,500	5,900	8,900

1/ Massachusetts Department of Environmental Management, Massachusetts Outdoors, The Statewide Comprehensive Outdoor Recreation Plan, Public Draft, Boston, Massachusetts, February 1976, p. VII-1.

MASSACHUSETTS WATER RESOURCES STUDY

BERKSHIRE REGION

Table 10-6

Present and Projected Needs for Four Recreation Activities 1/

Activity	1970 Supply in 1,000 Activity Days	1970 Need in 1,000 Activity Days	Projected 1990 Need in 1,000 Days	Projected 2010 Need in 1,000 Days
Camping	395	- 17	109	263
Picnicking	533	92	301	555
Swimming2/	672	436	559	704
Boating	273	250	425	638

1/ Need is the difference between the known or projected supply and the known or projected demand. A minus designation indicates supply exceeds demand and a surplus is available. A plus denotes a deficiency.

2/ Only swimming at lake and pond beaches is listed here. A portion of swimming demand will be met by swimming pools and similarly a portion of swimming demand will be met out of Region at Atlantic Ocean beaches.

The Berkshire Region is unusual in that there is presently a small surplus of camping facilities. Approximately ten percent of the present statewide supply of camping facilities are located in the Berkshire Region. The population of the region was approximately 2.5 percent of the state total in 1970. Note, however, that the projected needs for 1990, are expected to negate the present surplus and exceed the projected supply.

The 1976 Massachusetts SCORP report suggests that most swimming facilities should be located within walking or bike riding distance of urban or suburban areas. In Berkshire County about 71 percent of the presently available swimming facilities are in low population density areas. Future planning and installation of swimming facilities should favor those sites located in or near the more densely populated portions of Berkshire County.

In the Berkshire Region there are 20 ponds or lakes, larger than 25 acres, upon which public boating is permitted. The total surface area of these water bodies is approximately 3,650 acres. There are 7 lakes which are 200 acres or more in size which are suited to water skiing. At present there are about 25 acres of recreation water available per 1,000 people. The Soil Conservation Service's Natural Resource Planning Program[1/] estimates that 60 acres of recreation water are needed to provide safe and enjoyable boating per each 1,000 people of the population. Using this rate the present population of the Berkshire Region would require an additional 4,050 acres of recreation water. This figure is reasonably close to our projected need of 3,500 acres for the present population.

Although a concerted effort to acquire and develop recreation lands is expected to continue, it is apparent that the projected demands will far exceed the projected supply of swimming, picnicking, camping, and boating facilities by the year 2010. If this increased demand for recreation surpasses the increase in facilities, it could cause overuse in some areas. To help prevent this, recreation use will have to be monitored to insure that site deterioration does not occur.

1/ The criteria for this program are based on available standards used by state and federal recreation agencies. The present criteria are for the upland portions of Massachusetts and may not entirely fit the Berkshire mountain portion of the state.

Protection of unique natural and cultural areas is also a recreational objective. As mentioned earlier, many of the region's unique areas are adequately protected but there is need to protect the 21 sites pinpointed as not "safe indefinitely" by the New England Natural Resources Center inventory. The inventory further categorizes them as to significance--local, state and New England region. Eleven areas are of state or New England significance and the remaining are only of local importance.

With the progress being made in improving the water quality of the rivers and streams (see Chapter 7, Water Quality), there are now much stronger reasons for developing the recreation potential of flood plains and riverine corridors. Portions along the main stems of the Hoosic and Housatonic Rivers may appropriately be developed to meet some of the recreation needs discussed earlier.

The three streams listed in Section 10.2, as having potential for inclusion in a state scenic and recreational rivers program are unique natural resources which deserve protection. If public access were assumed to all or portions of these stream sections, recreational uses could be promoted which do not impact unfavorably on the site resource values.

The possibility of this region's recreational facilities and in particular the state forests and parks helping to meet the recreational demands of inner city residents' needs to be studied in greater detail. The continuing Planning Process within the Department of Environmental Management is scheduled to address the question of recreation access and transport.

10.5 Alternatives

Two ongoing programs should be mentioned here:

1. The Washington Mountain Brook Watershed, a Public Law 566 Watershed Protection and Flood Prevention Project, in the towns of Lee and Washington, is now in the construction phase. The project involves three lakes including the 224-acre Washington Mountain Lake development which will be completed soon. As these three lakes will be located within October Mountain State Forest, public access is already assured. The tentative plans, prepared in 1967, for this project were to construct

400 picnic sites, 400 camping sites, and boat launching and beach areas. These recreational measures were to be installed within five years after the lakes were completed.

2. The Wild Acres Reservation Improvement project in Pittsfield is a Resource Conservation and Development project which is constructed around a small fishing pond and a wildlife marsh. A pavilion and picnic area, nature study and interpretation area, and a softball and playground area are all planned for this reservation. Approximately twenty picnic tables will be provided.

The following alternatives could meet 1990 needs:

Camping

The private sector and municipalities can be expected to provide an additional 240 camp sites by 1900.

1. The Division of Forests and Parks could provide by 1990:
   200 additional camp sites at October Mountain State Forest
   20 additional camp sites at Mt. Greylock State Reservation
   20 additional camp sites at Beartown State Forest.

Picnicking

2. The Division of Forests and Parks could provide by 1990:
   100 additional picnic sites at October Mountain State Forest
   300 additional picnic sites to be divided among the larger state forests or reservations, Mt. Greylock State Reservation, Bashbish Falls State Forest, Beartown State Forest, Cookson State Forest and Pittsfield State Forest.
3. The remaining 350 picnic sites needed for 1990 could be provided by the following means:
   The Berkshire-Franklin Resource Conservation and Development (RC&D) Project program could install 250 or more picnic sites, to be located in public water-based recreation developments, within the region. These developments will be cost shared with the cities and towns and/or the state.

   Approximately 100 picnic sites could be installed by the cities and towns in community recreation projects other than RC&D projects.

<u>Swimming</u>

An additional 9,300 linear feet of beach are needed to meet 1990 planning needs. Additional or new beaches at existing lakes, ponds and streams or providing beaches at newly constructed ponds or lakes are the two available options to meet needs. In addition, most new beach construction should be accessible to the region's population centers.

4. Expansion of existing beaches presently operated by communities. Suggested expansion is:
   Onota Lake, Pittsfield, 1,000 feet
   Laurel Lake, Lee, 600 feet
   Windsor Lake, North Adams, 600 feet
   Lake Mansfield, Great Barrington, 300 feet.
   This work could be done by the communities with assistance from the RC&D program or the United States Department of the Interior, Bureau of Outdoor Recreation (BOR) Land and Water Conservation Fund.
5. Provision of beaches at three existing ponds or to ponds under construction. Length of beach is shown:
   Center Pond, Dalton, 500 feet
   Washington Mountain Lake, Washington, 1,000 feet
   Cheshire Reservoir, Cheshire and Lanesborough, 1,000 feet.
   The Center Pond, Dalton, proposal is now in the preliminary planning stage in the RC&D program. The town of Dalton would ultimately manage this project.

   As mentioned above, construction on Washington Mountain Lake, in October Mountain State Forest, should be completed soon. This site has potential to satisfy much of the region's swimming needs.

   Cheshire Reservoir and Berkshire Pond, which is about 600 feet upstream of Cheshire Reservoir, could supply boating, fishing and swimming recreation if access was assured. Either the towns involved, Cheshire and Lanesborough, and/or the Massachusetts Division of Forests and Parks could manage this area.

6. Construction of new recreation impoundments and inclusion of 750 feet of beach at each site.

Appendix B, Evaluation of Potential Reservoir Sites, evaluates 87 sites for swimming potential. The northern portion of the region, which has only a small percentage of the region's surface water, has few opportunities for new surface water. This is usually because of adverse site geology. Opportunity for new surface water impoundments are concentrated in the smaller towns and particularly in the southern portion of the region. See alternative 8 below.

Boating

An additional 5,900 acres of surface water with public access are the regional 1990 needs for boating.

7. Provide public access and construct public access ramps, by Massachusetts Public Access Board, at Onota Lake, Pittsfield; Cheshire and Lanesborough; Ashmere Lake, Hinsdale; Goose and Upper Goose Ponds, Lee and Tyringham; Lake Garfield, Monterey; and Mill Pond, Sheffield.

   These waters total approximately 1,900 acres.

8. Construction of potential reservoir sites, HO-908, HO-1205, HO-1208 and/or HO-1406.

   These are a selection of the better rated sites for boating. Approximate acreage is 950 acres. These impoundments could be built with RC&D assistance.

9. Establishment of a recreational corridor to develop the recreation potential, especially boating, of the Housatonic River from Risingdale in Great Barrington to the Connecticut stateline in Sheffield. This 25-mile stretch of the Housatonic River is showing improvement in water quality due to the new or improved wastewater treatment facilities installed upstream. When facility construction is complete upstream, this reach of the Housatonic should be able to reach its proposed "B" water quality classification.

   This river corridor could be developed as a RC&D public water-based recreation development including: boating, especially canoeing, hiking, picnicking at river bank sites, and could be coordinated with proposals; such as, the Great Barrington Town Plan's Riverside Park plan for downtown Great Barrington.1/

1/ Carney, William, Great Barrington Town Plan, December 1973.

Protection of unique natural areas

There is a variety of "best" ways to protect unique natural areas. Purchase by public, by quasi-public entities, or by more localized, town sized conservation and preservation nonprofit corporations is the strongest method for most cases. However, there are situations where continued private ownership and/or private protective associations are a preferred solution.

10. Establishment of a regional committee to develop a program for protection of unique natural areas

    This committee should contain representation from the regional planning commission, the state, quasi-public conservation organizations and other interested groups. A major benefit of this will be to keep the various interested groups informed of activities or progress.

11. Designation of these river reaches as components of the Massachusetts Scenic and Recreational Rivers System (Massachusetts General Laws, Chapter 21, Section 17B)

1. Housatonic River from Risingdale dam in Great Barrington to the Connecticut stateline (Approximately 25 miles)
2. Williams River from the Massachusetts Turnpike in West Stockbridge to the confluence with the Housatonic River in Great Barrington (Approximately 10 miles)
3. The West Branch of the Green River to the confluence with the Green River and the Green River from this confluence to Sweets Corner, Williamstown (Approximately 5 miles).

12. Investigation of the feasibility of transporting inner city residents of the Springfield-Chicopee-Holyoke, Massachusetts area to state and other recreational facilities of the Berkshire Region. This could be addressed by the continuing planning process within the Massachusetts Department of Environmental Management and/or the Lower Pioneer Valley Regional Planning Commission.

CHAPTER 11 - PROGRAM IMPLEMENTATION ALTERNATIVES

11.1 SUMMARY

This chapter will:

1. Present more detailed information on the alternatives in the two objective four account format of the "Principles and Standards for Planning Water and Related Land Resources."
2. Define the applicability of ongoing USDA programs in the region.

11.2 Alternative Account Displays

The Principles and Standards (P&S) provide the basis for federal participation in water and related land resource planning. The two objectives for resource planning, as specified by P&S, are:

1. to enhance national economic development
2. to enhance the quality of the environment.

In addition, P&S directs that adverse and beneficial effects of a plan or alternative be displayed in two accounts, National Economic Development and Environmental Quality, and further suggests that these effects be displayed in two additional accounts, Regional Development and Social Well-Being.

The account format is designed to present decision-makers with the necessary data to make resource use decisions. Economic data can usually be quantified so that comparisons of costs and benefits can be easily made. Environmental and social well-being effects will usually be presented in qualitative terms of physical units which should only be compared with like units; for example, acres of beach in one alternative can be compared with acres of beach in another alternative, but acres of beach cannot be readily compared to acres of forestland.

Two alternatives were developed to meet 1990 needs which are the difference between projected demands and projected supplies for the future "without plan" condition. The alternatives are presented in the P&S four account system in Table 11-1, Alternative Accounts Display.

Table 11-1 also includes a brief discussion of compatibility among alternatives.

11.3 Ongoing USDA Programs

Forest Service

Renewable Resources Program

The Forest Resources Planning Act of 1974 provides for long-term planning for the management, protection and utilization of all renewable resources on forestland. The Forest Service and the Massachusetts Department of Environmental Management, Division of Forests and Parks, cooperatively conduct forestry programs on state and privately owned forestland. The forest resources of the Berkshire Region also benefit from research in various aspects of forestry conducted at 80 different laboratories and other scientific facilities. These activities are grouped into five systems: recreation, wildlife, timberland and water, human and community development.

Recreation System

The goal of this system is to increase the supply of outdoor recreation opportunities and services through programs which emphasize dispersed recreation. Assistance is given private forest landowners, who are interested in helping provide public recreation opportunities, or integrate multiple uses into their forest management programs.

Research is conducted to strengthen technology and understanding of recreation demands, trends, values and environmental impacts, as well as quantify and rank commodity and amenity values.

Wildlife System

This system provides for increased use and enjoyment of wildlife while increasing both the diversity and numbers of fauna and the protection of threatened and endangered species. Technical assistance and financial incentives encourage nonindustrial private forest landowners to include habitat protection and development among their own management objectives.

Research emphasizes habitat identification and improvement for endangered species and the impact of alternative forest practices on game and nongame habitats and populations.

Timber System

The goal for the timber system is to increase timber supplies and quality to the point where benefits are commensurate with costs. Opportunities to increase timber supply exist on small private holdings, as well as on Massachusetts state-owned forest areas. The program provides incentives for private timber landowners to grow commerical timber, and for improved use of the trees and logs that are harvested.

Major research includes better utilization of timber; improving the rates of timber growth and yield, improving the protection for forests from wild fire, insects and diseases; and providing better inventory and evaluation of resources.

Land and Water System

The land and water system is an aggregation of many basic stewardship and land treatment activities to meet minimum air and water quality standards. This system permits control of man-caused erosion on state and private forestlands through technical assistance and program support.

Important areas of research include the nature and extent of nonpoint sources of pollution, improved logging practices for fragile soils and steep slopes, and improved efficiency of fire prevention and firefighting operations.

Human and Community Development System

This system is concerned with the relationships between man and his forest environment. All renewable resource programs are focused to increase goods and services from forestland; this means serving employment, housing and other social needs. Assistance to communities is provided for urban and community forestry, rural community fire protection and land use planning. Conservation education and manpower training programs are designed to enhance the knowledge and skills of rural Berkshire residents.

Soil Conservation Service

Conservation Operations

Proper land treatment is the basic concern of the Soil Conservation Service. This is the purpose of the conservation operations program which provides

technical assistance and advice on soil and water conservation to land users through local conservation districts.

In the region, requests for assistance go to the Berkshire Conservation District, which determines priorities for the conservation operations program. The district is an arm of state government, having five unpaid supervisors whose job it is to consult with and advise the local SCS staff in scheduling their workload.1/

Soil Survey

The SCS has the federal leadership for conducting the National Cooperative Soil Survey. In Massachusetts, the soil survey is carried on cooperatively with the Massachusetts Agricultural Experiment Station. Soil survey activities include the mapping, classification, correlation, and interpretation of soils according to national standards. The surveys are a basic scientific inventory of soil resources, based on soil properties. These surveys identify the kinds of soils, their extent, location and characteristics.

Soil surveys play a vital part in planning by:

1. providing a permanent inventory of the soil resources
2. providing soil interpretations for various uses to guide planners at the local, regional, and state levels in making sound land use decisions for developing comprehensive plans
3. providing data on the location of:
    a. wetlands, steep land, rocky land and areas with a high water table
    b. areas suitable for waste disposal
    c. areas that are suitable for use as residential, commercial, industrial, or school sites
4. providing many other soil interpretations that contribute to planning for a better quality environment.

The soil survey for the region will be published in two reports, a Northern Berkshire County, and a Southern Berkshire County report. As an interim measure the SCS has recently prepared a general soil report for the county at a map scale of 1:48000.

1/ Berkshire Conservation District, Annual Report, 1974, Pittsfield, Mass.

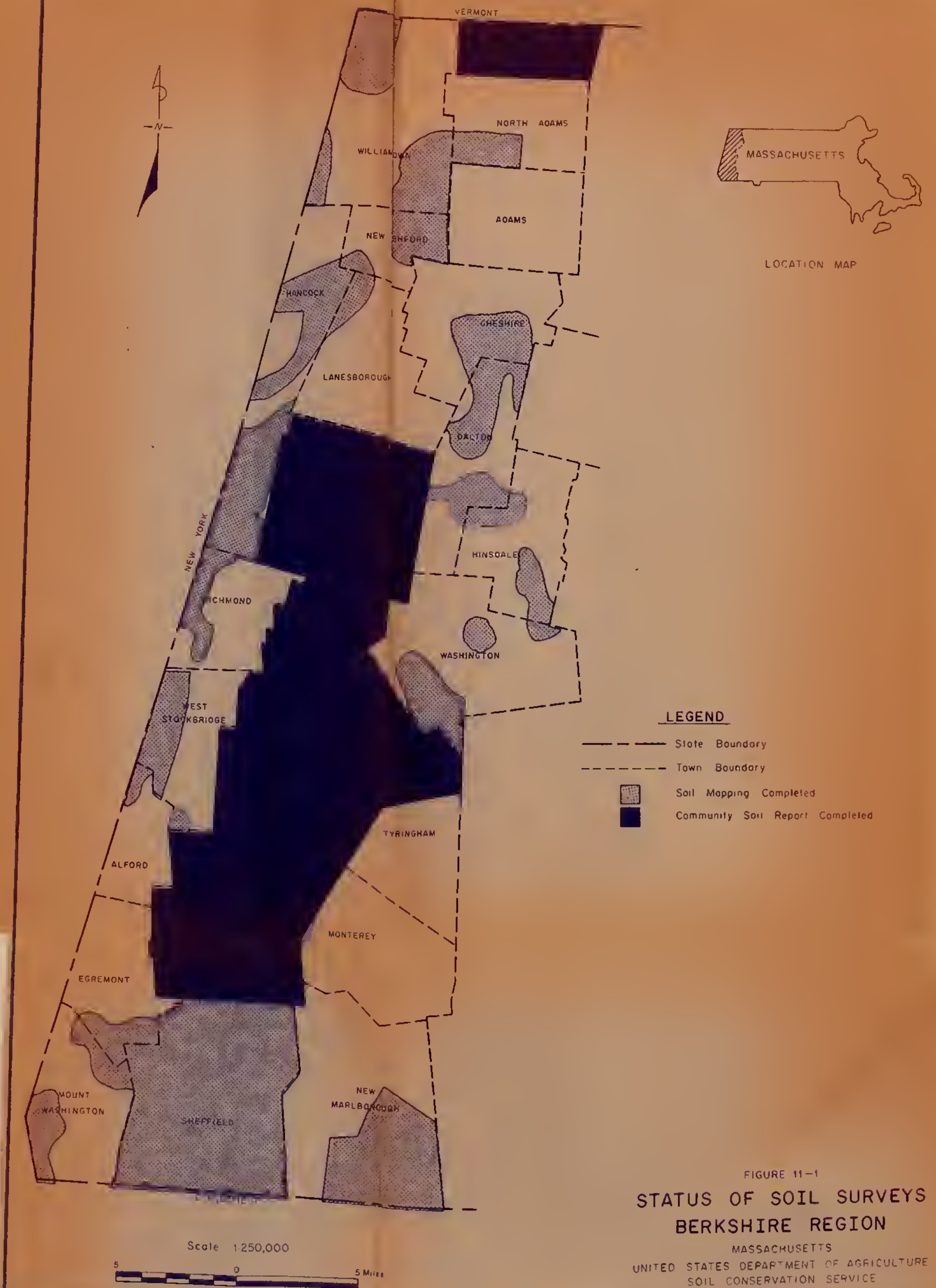

FIGURE 11-1

STATUS OF SOIL SURVEYS
BERKSHIRE REGION
MASSACHUSETTS
UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Considerable time is required to complete and publish the two Berkshire County survey reports. Many communities need, and want, soil survey information before the report is published in the usual manner. To provide this information ahead of the published report time, the SCS in Massachusetts prepares special soils reports for those communities which help pay for cost of preparation.

A town soils report consists of a narrative description of each soil found within the community, copies of the soil survey mapping sheets and interpretive maps. These interpretive maps show the limitations of the soils for selected uses, such as sewage disposal, home sites or industrial sites development. See Figure 11.1 for the status of the soil survey in the region.

Natural Resource Inventories

Natural resource inventories identify and describe areas with natural resource development potential within the community. Each area is described and its alternative development potentials are listed in a report. Opportunities and problems in the use of each site or areas are identified and discussed.

The Soil Conservation Service, Berkshire County Regional Extension Service, Massachusetts Division of Forests and Parks, Massachusetts Division of Fisheries and Wildlife and other agencies conduct natural resource inventories for communities. A community wishing a natural resource inventory requests help from the Berkshire Conservation District which, in turn, arranges for the inventory.

Natural resource inventories have been prepared for Adams, Dalton, Egremont, Great Barrington, New Marlborough, Pittsfield, Richmond and Sheffield. Inventories are in progress for Lee, Lenox and Williamstown.

Natural Resources Planning Program

The Natural Resources Planning Program provides for local communities to inventory their present natural resources, to rate those resources against standards and criteria, to determine the consequences of proposed actions on the natural resource base, and to plan the most acceptable future course of action to maintain or improve the community's level of environmental quality.

Considerable time is required to complete and publish the two Berkshire County survey reports. Many communities need, and want, soil survey information before the report is published in the usual manner. To provide this information ahead of the published report time, the SCS in Massachusetts prepares special soils reports for those communities which help pay for cost of preparation.

A town soils report consists of a narrative description of each soil found within the community, copies of the soil survey mapping sheets and interpretive maps. These interpretive maps show the limitations of the soils for selected uses, such as sewage disposal, home sites or industrial sites development. See Figure 11.1 for the status of the soil survey in the region.

Natural Resource Inventories

Natural resource inventories identify and describe areas with natural resource development potential within the community. Each area is described and its alternative development potentials are listed in a report. Opportunities and problems in the use of each site or areas are identified and discussed.

The Soil Conservation Service, Berkshire County Regional Extension Service, Massachusetts Division of Forests and Parks, Massachusetts Division of Fisheries and Wildlife and other agencies conduct natural resource inventories for communities. A community wishing a natural resource inventory requests help from the Berkshire Conservation District which, in turn, arranges for the inventory.

Natural resource inventories have been prepared for Adams, Dalton, Egremont, Great Barrington, New Marlborough, Pittsfield, Richmond and Sheffield. Inventories are in progress for Lee, Lenox and Williamstown.

Natural Resources Planning Program

The Natural Resources Planning Program provides for local communities to inventory their present natural resources, to rate those resources against standards and criteria, to determine the consequences of proposed actions on the natural resource base, and to plan the most acceptable future course of action to maintain or improve the community's level of environmental quality.

The Natural Resources Planning Program:

1. gives citizens the major role, with local people doing most of the work, making all the decisions, and implementing any needed changes in community policies to meet their goals
2. closely relates the community's natural resource base to numbers of people the natural resources can safely support
3. provides help from regional technical teams that represent many agencies and disciplines. The teams are composed of personnel from the Soil Conservation Service, Cooperative Extension Service, Massachusetts Division of Fisheries and Wildlife, and Massachusetts Division of Forests and Parks. Other state and federal agencies assist as requested. The Berkshire Conservation District accepts applications from communities requesting the program, screens the applications, establishes priorities for assistance by the technical teams, and coordinates agency assistance to the selected communities
4. includes standards and criteria for rating the resource base
5. is "open ended": Local citizens can continually monitor their area's natural resource condition and update land use plans as needed.

One of the most important aspects of the program is its emphasis on citizen involvement. Local citizens provide the personnel to: (1) inventory, in detail, the present natural resources of their community (2) rate these natural resources against existing standards and criteria (3) identify problem areas (4) assess alternative courses of action (5) prepare a definite plan of action and then, (6) implement planned measures to maintain or enhance their natural resources to achieve the community's selected level of environmental quality. Whatever course of action a community chooses, through use of the program, the community will know in advance the likely consequences of those actions on the natural resource base.

Three towns, Lee, Lenox and Stockbridge, have started work under this program.

<u>Berkshire-Franklin Resource Conservation and Development Project</u>

The Berkshire-Franklin Resource Conservation and Development (RC&D) Project is a locally initiated, sponsored and directed project which is planned to accelerate the conservation and development of natural resources; improve the general level of economic activity; and enhance the environment and standards of living.

Each RC&D project has its own unique goals which may include objectives; such as, developing land and water resources for agriculture, municipal or industrial uses; expanding recreation facilities; encouraging industries to process products of the area, expand, if needed, and locate new industries in the area as appropriate; improve markets for crops, livestock and forest products; improve needed community facilities, such as, hospitals, schools, sewage treatment plants, and roads; and encourage training programs to improve job skills. RC&D projects are sponsored by conservation districts and town and county governments, and may include municipalities, state agencies, comprehensive planning agencies, and local nonprofit organizations.

The Soil Conservation Service of the U. S. Department of Agriculture has the administrative responsibility for this program. Other Department of Agriculture agencies assisting are the Economic Research Service, Extension Service, Farmers Home Administration and the Forest Service. The Berkshire-Franklin RC&D Project includes all of Berkshire and Franklin counties.

Watershed Program (PL 566)

The Watershed Protection and Flood Prevention Act (Public Law 566) provides federal technical and financial assistance to states, local communities, conservation districts, and other groups in solving their land and water problems. The Soil Conservation Service administers the watershed program for the U. S. Department of Agriculture. The responsibility for soil and water conservation applicable to lands used for forestry purposes and the forestry phase of the PL 566 program lies with the U. S. Forest Service. This includes the planning and installation of forestland treatment measures on privately owned land. The Forest Service provides financial and professional assistance to the state. The state forester furnishes the on-the-ground assistance to the private landowner.

Project purposes which may be included in a PL 566 watershed plan include: conservation land treatment, flood prevention, agricultural water management, industrial and municipal water supply, recreation, and fish and wildlife. Flood prevention must be a major concern in each project. PL 566 watersheds are limited to 250,000 acres in size. The program helps to solve land and

water resource problems which cannot be solved by individual landowners on their own property. Close cooperation is required between the Forest Service, the Soil Conservation Service, state agencies and local organizations in developing and carrying out watershed plans.

The PL 566 watershed program helps improve the quality of the natural resource base, the quality of the environment, and the quality of the standard of living by:

1. reducing erosion and sedimentation through the application of land treatment practices
2. identifying flood hazard areas for flood plain management measures
3. promoting proper land use and management
4. improving agricultural water management practices
5. providing multiple purpose reservoirs for recreation, fish and wildlife, and water supply
6. reducing flood damages, hazards to life and health, and the inconvenience caused by flooding.

Within the region, the Washington Mountain Brook Watershed and the Blackberry River Watershed are authorized for installation.

An application for planning assistance under this program can be submitted to the Massachusetts Water Resources Commission by any qualified local organization.

MASSACHUSETTS WATER RESOURCES STUDY - BERKSHIRE REGION
TABLE 11-1: ALTERNATIVE ACCOUNTS DISPLAY

ALTERNATIVE	COMPATIBILITY WITH OTHER ALTERNATIVES	NATIONAL ECONOMIC DEVELOPMENT (NED)	ENVIRONMENTAL QUALITY (EQ)	REGIONAL DEVELOPMENT (RD)	SOCIAL WELL-BEING (S W-B)
		Beneficial Effects	Beneficial or Adverse Effects	Beneficial Effects	Beneficial or Adverse Effects
CH. 3 - LAND USE 3-1a) Preserve existing quantities of agricultural land.	Compatible with all other alternatives with exception of erosion - sedimentation and water quality alternatives.	1) Net earnings derived from agricultural land that would be lost without preservation. 2) Food cost savings to the extent that production losses would be imported from other areas, thus increasing food prices to region's residents. Adverse Effects 1) Costs of preservation measures more expensive than present policies.1/ A. Purchase-lease-back Program: Initial cost of purchase ($600 - $3,000 per acre) minus revenues derived from renting to agricultural entrepreneurs.	1) Benefit would be derived to the extent that preservation of agricultural land would enhance the aesthetic qualities of the region in terms of diversified land use mix. 2) Maintaining agricultural land would preserve boundary areas which would enhance wildlife habitat. 3) Increased pesticide, herbicide and other residues entering water areas through runoff has a detrimental impact on environmental quality. 4) Increased erosion and sedimentation resulting from cultivating preserved acreage.	1) Benefits accrue to the extent that rates of unemployment and under-employment fall relative to such rates if land were not preserved. 2) Much tourism due to aesthetic qualities which are enhanced through the maintenance of a diversified land use mix. Benefits accrue to the extent that preservation of agricultural land enhances the tourist industry.	1) Social Well-Being is enhanced to the extent that preservation measures enhance the aesthetic qualities of the region. 2) To the extent that preservation measures result in lower food prices than would exist without a Preservation Program, S W-B is increased.

1/ Values of agricultural land in the region is dependent upon provision of roads, water, sewer, electricity and physical characteristics. Recent (1976) land sales suggest a price range of $600 to $3,000/acre. According to Berkshire County Development Commission, agricultural land of good quality sold for farming purposes averaged approximately $1,000/acre. A Purchase-leaseback Program would involve the $600 - $3,000 range. Prices that would be relevant for a Development Rights Program would be to determine an acceptable rate of return per acre and from that determining the capital cost of purchasing that land based on an acceptable return and subtracting the capital cost/acre from the market value of the land. This program is further complicated by the fact that, although almost all agricultural land is zoned residential, much land would not be developed due to location of flood plains, wetlands, and/or the physical characteristics of the land itself. Thus, under these circumstances, prices of development rights would be negligible.

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		Beneficial Effects	Beneficial or Adverse Effects	Beneficial Effects	Beneficial or Adverse Effects
CH. 3 - LAND USE 3-1 a (cont'd)		Adverse Effects (cont'd) B. Development Rights Program: Cost of Purchasing Development Rights. Beneficial Effects		Adverse Effects 1) One potential adverse impact stems from the development that would occur on the preserved acreage without a preservation program and that which would not occur with a preservation program. Although there is enough developable land in the region, even with a Preservation Program, added costs of developing nonpreserved land may result in some firms locating elsewhere.	
3-1 b Agricultural Land - Continue present land use policies (zoning and agricultural assessments).	Compatible with most other alternatives with the exception of wildlife alternatives.	Relative to agricultural land preservation programs, use of present policies minimizes public expenditures.	1) Decrease in agricultural land will result in less use of pesticides and herbicides, thus decreasing chemical residues entering water supply through runoff.	Adverse Effects Adverse effects will result to the extent that unemployment increases as a result of decreased agricultural income.	Decreases in agricultural land decreases the aesthetic qualities of the area. 2) Decreases in production results in increased food costs (resulting from increased importation) to the region's consumers.

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CH. 3 - LAND USE 3-1 b (cont'd)		Beneficial Effects Adverse Effects 1) Projected loss of approx. 12,000 acres (including nearly 6,000 acres of potentially tillable land) and net income potential from lost production.1/ 2) Prorated cost of administering zoning ordinances. 3) Loss of tax revenues from agriculture-horticulture assessments.	Beneficial or Adverse Effects 2) Erosion-sedimentation decrease resulting from less land being cultivated. 3) Land use mix will become less diversified, thus lowering the aesthetic quality of the area. 4) Boundary areas between open land and forestland will decrease, thus lowering amounts of wildlife feeding habitat.	Beneficial Effects	Beneficial or Adverse Effects

1/Approximate agricultural valuations (state averages) were computed by Dr. E. Engle, Department of Food and Resource Economics; University of Massachusetts (1974) for eight categories of agricultural land. Shade tobacco and nursuries: \$480 - 720/acre; binder tobacco, vegetables, potatoes: \$150 - 230/acre; cropland, pasture (tillable): \$110 - 170/acre; orchards: \$160 - 240/acre; cranberry bogs: \$560 - 840/acre; untillable permanent pasture: \$40 - 60/acre; farm woodland: \$20 - 30/acre; nonproductive farm woodland - \$5 - 7/acre.

MASSACHUSETTS WATER RESOURCES STUDY - BERKSHIRE REGION
TABLE 11-1: ALTERNATIVE ACCOUNTS DISPLAY

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		Beneficial Effects	Beneficial or Adverse Effects	Beneficial Effects	Beneficial or Adverse Effects
CH. 3 - LAND USE 3-2) Manage forestlands primarily for the production of increased quantities of wood products.	Is least compatible with acquisition and preservation alternatives in the Wetlands, Fish & Wildlife and Recreation Chapters.	1) Increase annual sawtimber production by 2,226,000 c.f. valued at $2,003,000. 2) Increase annual pulpwood production by 2,000,000 c.f. valued at $888,000. 3) Increase annual recreation by 19,000 visitor days valued at $47,500. 4) Increase annual flow by 96,000 a.f. valued at $235,000. Adverse Effects 1) Initial cost of new mill for low grade small material of $5,000,000. 2) Annual costs of operation and maintenance of program $645,000. 3) Annual increase in sediment production of 742 tons at a cost of $7,400.	Increase in sediment production of 740 tons/year, at a cost of $7,400/year.	1) Increase in regional employment from new jobs, 10 of which will be professional foresters. 2) Increase in regional income from the increase in recreation visitor days. Adverse Effects 1) Private cost of operation and maintenance of the program of $500,000/year.	1) Increased employment from new plant and increased forest management. 2) Decrease in water quality due to additional sediment production of 742 tons/year.

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		Beneficial Effects	Beneficial or Adverse Effects	Beneficial Effects	Beneficial or Adverse Effects
CH. 3 LAND USE 3-3) Manage forestlands for multiple uses to provide increased recreation opportunities and fish and wildlife habitats.	Compatible with all alternatives in Ch. 6, Wetlands; Ch. 9, Fish & Wildlife; and Ch. 10, Recreation.	1) Increase in saw-timber production of 1,113,000 c.f./year valued at $1,001,700. 2) Increase in streamflow of $47,000 a.f./yr. valued at $117,500. 3) Increase in annual recreation visitor days. Adverse Effects 1) Initial cost of establishing a small treatment mill for posts and piling $1,000,000. 2) Operation and maintenance of mill and program $170,000/yr. 3) Increase sediment production by 300 tons/yr. at a cost of $3,000/yr.	1) Improve wildlife habitat through forest management. 2) Management, protection and enhancement of areas of natural beauty and human enjoyment by managing forestland for multiple uses. 3) Decrease in water quality due to additional sediment production of 300 tons/yr. at $3,000/yr.	1) Increase in regional employment from new jobs, 2 of which will be professional foresters. 2) Increase in regional income from the increase in recreation visitor days. Adverse Effects 1) Private cost of operation and maintenance of the program of $50,000/yr.	1) Increased employment from new plant and increased forest management. 2) Decreased water quality from the addition of 300 tons of sediment per year.

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CH. 3 - LAND USE 3-4) Preserve existing forestlands through public acquisition and restriction of uses that conflict with environmental objectives or aesthetic goals.	Is most compatible with acquisition alternatives in the wetlands, wildlife and recreation chapters. Is least compatible with the maximum wood and multiple use alternatives in the land use chapter.	Beneficial Effects Adverse Effects 1) Decrease in commercial forestland due to acquisition program, which will result in a decrease in forest product production.	Beneficial or Adverse Effects 1) Provide areas of natural beauty and human enjoyment through the acquisition of regionally important wetland forests, flood plain forests, wilderness areas, and aesthetic areas. 2) Management, preservation, or enhancement of especially valuable or outstanding biological resources by preserving wildlife habitat in forested areas. 3) Improve water quality by restricting uses on critical erosion areas. 4) Avoiding irreversible and irretrievable commitments of resources by restricting development on forestland.	Beneficial Effects Adverse Effects	Beneficial or Adverse Effects 1) Increase in water quality due to less sediment from forestland.

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CH. 4 - FLOODING 4-1) Towns of New Ashford, Mount Washington, Tyringham, and Washington participate in the HUD Flood Insurance Program. Joining the program entails establishing effective flood plain restrictions;such as, zoning, subdivision controls and building regulations for development within the flood plains.	Is compatible or complementary to other alternatives.	Beneficial Effects 1) Prevents increases in damageable properties. 1/ Adverse Effects 1)$120,000 initial cost of program. 2) $3,500 per year for operation and management of program.	Beneficial or Adverse Effects 1) 2,500 acres of non-renewable resource lands (flood plains) protected as a result of required land use regulations. 2) Tends to maintain existing water quality by preventing building development close to streams. 3) Maintenance of streamsite habitats minimizes hazards to endangered species of animals, fish and plants.	Beneficial Effects 1) Prevents increases in damageable properties. 2) Prices of buildable land may go up, thus increasing property values. Adverse Effects 1) 2,500 acres of land no longer available for residential, commercial or industrial use. 2) Prices of buildable land may go up which may adversely effect industrial and commercial activity. 3) $1,000 per year for regional operation and management costs of program.	Beneficial or Adverse Effects 1) Psychological satisfaction from the action. 2) Program will help maintain present neighborhood character in vicinity of flood hazard areas. 3) Remaining uplands will be subject to accelerated neighborhood change. 4) Present landowners may face loss of property value due to program. 5) Provides a more equitable distribution of flood hazard risks.

1/Only a small number of homes, less than 20 homes in 4 towns.

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ALTERNATIVE	COMPATIBILITY WITH OTHER ALTERNATIVES	NATIONAL ECONOMIC DEVELOPMENT (NED)	ENVIRONMENTAL QUALITY (EQ)	REGIONAL DEVELOPMENT (RD)	SOCIAL WELL-BEING (S W-B)
CH. 4 - FLOODING		Beneficial Effects	Beneficial or Adverse Effects	Beneficial Effects	Beneficial or Adverse Effects
4-2) Implement structural measures. A program of structural measures is economically feasible in the following subwatersheds: HO-1, 2, 3, 4 & 6 (Upper Housatonic River) and HU-4 (Green River in Williamstown).	Compatible with other flooding (Ch. 4) alternatives conflicting with Ch. 5 alternative 2 "Stream Buffer Zones", Ch. 10 Alternative 1/ "Scenic & Recreational Rivers".	1) Average annual flood damage will be reduced by $560,000. Adverse Effects 1) Average annual cost is estimated to be $270,000.	1) Irreversible commitment of 460 acres of land for program measures. 2) 6.2 miles of streams altered for project measures.	1) 400 acres of developed land no longer subject to flooding from 100-year storm. 2) Average annual damage will be reduced by $560,000. 3) Creates 102 man years semi-skilled employment. Adverse Effects 1) Local average annual cost is est. to be $30,300.	1) Reduces health and safety hazards associated with flooding. 2) Psychological satisfaction from the action. 3) Some landowners may be adverse to the action. 4) Creates 102 man years semi-skilled employment. (Unemployment rate is approximately 13%).

1/ Discount est. 6 1/8%, 100 year evaluation period.

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		Beneficial Effects	Beneficial or Adverse Effects	Beneficial Effects	Beneficial or Adverse Effects
CH. 4 - FLOODING					
4-3) Implement Flood-Proofing A program of flood-proofing existing structures is economically feasible in the following subwatersheds: HO-1, 2, 3, 4, 6, 9, 11, 14 & HU-2, 3, 4, 5.	Compatible with other Ch. 4 (Flooding) alternatives, and with all other alternatives.	1) Avg. annual flood damage will be reduced by $397,000 . Adverse Effects 1) Total avg. annual cost is est. to be $17,000.	1)May adversely effect appearance of some existing structures.	1) Avg. annual damage will be reduced by $397,000. 2)Will create 7 man years semi-skilled employment. Adverse Effects 1)Local avg.annual cost is est. to be $15,300.	1) Reduces health and safety hazards associated with flooding. 2) Psychological satisfaction from the action. 3) Some landowners may be adverse to the action. 4) Will create 7 man years semi-skilled employment. (Unemployment rate is approx. 13%).

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		Beneficial Effects	Beneficial or Adverse Effects	Beneficial Effects	Beneficial or Adverse Effects
CH. 4 - FLOODING 4-4) Implement both structural measures and flood proofing. A program combining structural measures with flood proofing is economically feasible in the following subwatersheds: HO-1, 2, 3, 4, 6 and HU-4.	Is compatible or complementary with all other alternatives.	1) Average annual damage will be reduced by $583,000. Adverse Effects 1) $275,000 average annual costs.	1) Irreversible or irretrievable commitment of 460 acres of land for program measures. 2) 6.2 miles of stream channel are altered for project measures. 3) May adversely effect the appearance of some existing structures.	1) Average annual damage will be reduced by $583,000. 2) 400 acres of developed land no longer subject to flooding from 100-year storm. 3) Will create 105 man years semi-skilled labor. Adverse Effects 1) Local average annual cost is est. to be $40,000.	1) Psychological satisfaction from the action. 2) Some landowners may be adverse to the action. 3) Will create 105 man years semi-skilled labor (unemployment rate is approx. 13%). 4) Reduces health and safety hazards associated with flooding.

MASSACHUSETTS WATER RESOURCES STUDY - BERKSHIRE REGION
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ALTERNATIVE	COMPATIBILITY WITH OTHER ALTERNATIVES	NATIONAL ECONOMIC DEVELOPMENT (NED)	ENVIRONMENTAL QUALITY (EQ)	REGIONAL DEVELOPMENT (RD)	SOCIAL WELL-BEING (S W-B)
CH. 5 - EROSION & SEDIMENT 5-1) Establish erosion and sediment control ordinances in municipalities with the most potential for urban development.	Is compatible or complementary to other alternatives. Is most compatible with water quality and fishery alternatives.	Beneficial Effects 1) $24,000/yr. sediment damage reduction. Adverse Effects 1) $18,000 initial capital cost to initiate program. 2) $4,500/yr. to manage program.	Beneficial or Adverse Effects 1) Reduce erosion on 400 acres/yr. of construction sites. 2) Eliminate 4000 tons/yr. of construction site produced sediment. 3) Improvement of water quality downstream.	Beneficial Effects Adverse Effects	Beneficial or Adverse Effects 1) Will increase cost of developing land for urban purposes.
5-2) Establish a project measure in the Berkshire-Franklin RC&D project area to: - Inventory and map all critical areas and problem streambanks. This inventory to be repeated at 3 to 5 year intervals. - Stabilize these problem areas with technical and financial assistance provided through the RC&D project.	Is compatible or complementary to other alternatives.	Beneficial Effects 1) $150,000 per year sediment damage reduction. Adverse Effects 1) $133,000/yr. cost of program.	1) Reduce erosion on 750 acres of critical erosion problem areas and 57 miles of problem streambanks. 2) Eliminate 25,000 tons/yr. of sediment from these sources. 3) Improve stream water quality.	Beneficial Effects 1) Will create 33 semi-skilled jobs for 1 year. Adverse Effects	1) Will create 33 semi-skilled jobs for 1 year. 2) Psychological satisfaction from the action.
5-3) Establish and maintain stream buffer zones, forest and other permanent vegetative cover, within 50 ft. of the region's rivers and streams.	Is compatible or complementary to other alternatives.	Beneficial Effects 1) Action results in slowing down of streambank erosion and subsequent sedimentation. Adverse Effects 1) Annual administration cost of program is estimated to be $2,000. 2) Loss of production on about 300 acres of agricultural land.	1) Reduce erosion on 65 stream miles (130 bank miles) and thereby reduce subsequent sedimentation. 2) Establish permanent vegetation on approximately 800 acres. 3) Maintain permanent vegetation along additional 265 miles of rivers and streams.	Beneficial Effects 1) May increase the supply of recreation activity days in the region. Adverse Effects	1) Some landowners may be dissatisfied with reduction in cropland acreage. 2) Psychological satisfaction from the action.

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CH. 5 - EROSION & SEDIMENT 5-3) continued		Beneficial Effects	Beneficial or Adverse Effects 4) Improve stream water quality. 5) Improve quality of fish and wildlife habitat.	Beneficial Effects	Beneficial or Adverse Effects
CH. 6 - WETLANDS 6-1) Delineate the region's wetlands on large scale maps (Great Barrington, Lee, Lenox, and Stockbridge are completed).	Is compatible or complementary with other alternatives.	Beneficial Effects 1) Provides basis around which future recreation and other wetland uses may be planned. Adverse Effects 1) Initial capital cost is estimated to be $43,000.	1) May lead to preservation of environmentally unique and valuable areas.	Beneficial Effects 1) Provides basis from which to identify flood control value and to administer Mass. wetlands laws. 2) Will provide 3 man years skilled labor. 3) Provides basis around which future recreation areas may be planned. Adverse Effects 1) Initial capital cost is estimated to be $43,000.	Beneficial Effects 1) Psychological satisfaction from the action. 2) Creates 3 man years skilled labor in high unemployment area.
6-2) Create a regional wetlands protection organization with representatives from the Berkshire County Regional Planning Commission, municipalities, state agencies and quasi-public groups, to coordinate protection, acquisition, and management efforts for the region's wetlands. This group should promote economic uses for	Is compatible or complementary with all other alternatives.	Beneficial Effects 1) Provides tool for identifying and initiating compatible economic uses for wetlands. Adverse Effects 1) Annual cost is estimated to be $4,000.	1) May lead to preservation of environmentally unique and valuable areas.	Beneficial Effects 1) Provides tool for identifying and initiating compatible economic uses for wetlands. Adverse Effects 1) Annual cost is estimated to be $4,000.	1) Psychological satisfaction from the action. 2) Some resource owners may be adverse to the action.

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		Beneficial Effects	Beneficial or Adverse Effects	Beneficial Effects	Beneficial or Adverse Effects
CH. 6 - WETLANDS 6-2) continued wetlands which are compatible with wetland capabilities.					
6-3) An accelerated acquisition program to acquire an additional 2000 acres (1200 acres are expected to be acquired under ongoing programs) of regionally important wetlands.	Is compatible or complementary with other alternatives.	Beneficial Effects 1) Will contribute to meeting recreational and educational needs. 2) Tends to maintain recreational quality of 2000 acres. Adverse Effects 1) Average annual cost is estimated to be $51,600.	1) Will tend to preserve existing wildlife habitat. 2) May preserve environmentally unique and valuable areas. 3) Irreversible commitment of 2000 acres prevented. 4) Tends to maintain existing water quality. 5) Tends to maintain low flow regime.	Beneficial Effects 1) Will contribute to meeting recreational and educational needs of region. Adverse Effects 1) Average annual cost is estimated to be $51,600. 2) Prices of buildable land may increase and adversely effect economic activity. 3) Decrease property tax base.	1) Psychological satisfaction from the action. 2) Some resource owners may be adverse to the action.
CH. 7 - WATER QUALITY 7-1) Obtain detailed soil surveys and use them to aid in guiding growth in the following communities: a) Egremont b) Monterey c) New Marlborough d) Richmond e) Sheffield	Is compatible or complementary with all other alternatives.	Beneficial Effects 1) Assists in determining least cost alternatives to solving water quality problems. Adverse Effects 1) Initial cost is estimated to be $62,400.	1) Provides tool for maintaining present quality of all water and related land resources.	Beneficial Effects 1) Will create 1.5 man years employment for a professional soil scientist. Adverse Effects 1) Initial cost to towns within region is estimated to be $31,200.	1) Psychological satisfaction from the action. 2) Provides basis for determining public health problems associated with water quality.
7-2) The following communities should develop a lake quality protection program. This program should include development of long range plans for sewage collection and	Is compatible or complementary with all other alternatives.	Beneficial Effects 1) Designed to determine least cost solution to water quality problems.	1) Maintains or improves present water quality.	Beneficial Effects 1) May increase value of present lake shore development.	1) Psychological satisfaction from the action.

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TABLE 11-1: ALTERNATIVE ACCOUNTS DISPLAY

ALTERNATIVE	COMPATIBILITY WITH OTHER ALTERNATIVES	NATIONAL ECONOMIC DEVELOPMENT (NED)	ENVIRONMENTAL QUALITY (EQ)	REGIONAL DEVELOPMENT (RD)	SOCIAL WELL-BEING (S W-B)
CH. 7 - WATER QUALITY 7-2 continued restriction of lake shore development: LAKE or POND a) Cheshire Reservoir in Cheshire, Lanesborough b) Lake Garfield in Monterey c) Lake Buel in Monterey, New Marlborough d) Richmond Pond in Richmond, Pittsfield e) Mill Pond in Sheffield f) Mud Ponds & Shaker Mill Pond in West Stockbridge g) Crane Lake in West Stockbridge		Beneficial Effects 2) Maintain present recreation value of water body. Adverse Effects 1) Initial cost estimated to be $115,000. 2) May lead to future expenses incurred for sewage collection.	Beneficial or Adverse Effects	Beneficial Effects Adverse Effects 1) Initial cost estimated to be $115,000. 2) May lead to future expenses incurred for sewage collection. 3) May increase prices of buildable lands adversely effecting residential development.	Beneficial or Adverse Effects 2) Some property owners may be adverse to the action.
CH. 8 - WATER SUPPLY & IRRIGATION 8-1) Develop groundwater sources to supply the 4.6 MGD regional deficit projected for 1990.	May conflict with wetlands and fishery alternatives.	Beneficial Effects 1) Since alternative is necessary for maintenance of life, health, and safety, monetary benefits are assumed equal to costs. (Initial cost is estimated to be $2,800,000). (Annual O&M is estimated to be $13,800.) Adverse Effects See 1) above.	1) May change water table in environmentally unique and valuable areas. 2) May effect quality of wildlife habitat. 3) Provides for more evenly distributed development. 4) May effect low-flow regime. 5) Provides a 4.6-MGD additional water supply to region.	Beneficial Effects 1) Since alternative is necessary for maintenance of life, health and safety, monetary benefits are assumed equal to costs. (Initial cost is estimated to be $2,800,000).(Annual O&M is estimated to be $13,800). 2) May attract industrial, residential or commercial development to the region.	1) Psychological satisfaction from the action. 2) Some landowners may be adverse to the action. 3) Tends to maintain quality of life with respect to water supply associated health and safety hazards. 4) Will create approximately 57 man years temporary semi-skilled jobs and 2 perm part-time semi-skilled jobs. (Unemployment rate in region is approximately 13%). 5) May induce higher rate of population growth due to immigration.

MASSACHUSETTS WATER RESOURCES STUDY - BERKSHIRE REGION
TABLE 11-1: ALTERNATIVE ACCOUNTS DISPLAY

ALTERNATIVE	COMPATIBILITY WITH OTHER ALTERNATIVES	NATIONAL ECONOMIC DEVELOPMENT (NED)	ENVIRONMENTAL QUALITY (EQ)	REGIONAL DEVELOPMENT (RD)	SOCIAL WELL-BEING (S W-B)
		Beneficial Effects	Beneficial or Adverse Effects	Beneficial Effects	Beneficial or Adverse Effects
CH. 8 - WATER SUPPLY & IRRIGATION 8-1) continued				3) Will create approximately 57 man years temporary semi-skilled jobs and 2 permanent part-time semi-skilled jobs. 4) Increases amount of developable land. **Adverse Effects** 1) See 1) above. 2) Development will be precluded at ground-water sites. (Approximately 150 acres).	
8-2) Develop surface water reservoirs to supply the 4.3-MGD deficit projected for Pittsfield, Lenox, and Clarksburg.	May conflict with fish and wildlife alternatives.	**Beneficial Effects** 1) Since alternative is necessary for maintenance of life, health, and safety, monetary benefits are assumed equal to costs. (Initial cost is estimated to be $6,500,000). (Annual O&M cost is estimated to be $32,300). **Adverse Effects** See 1) above.	1) May change water table in environmentally unique and valuable areas. 2) May effect quality of wildlife habitat. 3) Provides for more evenly distributed development. 4) May effect low-flow regime. 5) Provide 4.3 MGD additional water supply to Pittsfield, Lenox, and Clarksburg. 6) Results in loss of about 2.5 miles of stream channel	**Beneficial Effects** 1) Since alternative is necessary for maintenance of life, health, and safety, monetary benefits are assumed equal to costs. (Initial cost is estimated to be $6,500,000). (Annual O&M cost is estimated to be $32,300). 2) May attract industrial, residential or commercial development to the region. 3) Will create approximately 133 man years temporary semi-skilled jobs and 6 permanent part-time semi-skilled jobs.	1) Psychological satisfaction from the action. 2) Some landowners may be adverse to the action. 3) Tends to maintain quality of life with respect to water supply associated health and safety hazards. 4) Will create approximately 133 man years semi-skilled jobs and 6 permanent part-time semi-skilled jobs. (Unemployment rate in region is approximately 13%). 5) May induce higher rate of population growth due to immigration.

MASSACHUSETTS WATER RESOURCES STUDY - BERKSHIRE REGION
TABLE 11-1: ALTERNATIVE ACCOUNTS DISPLAY

ALTERNATIVE	COMPATIBILITY WITH OTHER ALTERNATIVES	NATIONAL ECONOMIC DEVELOPMENT (NED)	ENVIRONMENTAL QUALITY (EQ)	REGIONAL DEVELOPMENT (RD)	SOCIAL WELL-BEING (S W-B)
CH. 8 - WATER SUPPLY & IRRIGATION 8-2) continued		Beneficial Effects	Beneficial or Adverse Effects	Beneficial Effects 4) Increases amount of developable land. Adverse Effects 1) See 1) above. 2) Development will be precluded at water supply sites (Approximately 360 acres).	Beneficial or Adverse Effects
CH. 9 - FISH & WILDLIFE 9-1) The following streams are recommended for early acquisition of public access: a) Green River, Alford and Great Barrington b) Konkapot River, Monterey and New Marlborough c) Ironworks Brook, Sheffield d) Williams River, West Stockbridge e) Karner Brook, Egremont f) Sackett Brook, Pittsfield g) Umpachene Brook, New Marlborough	Construction of access facilities may cause minor increase in sediment and erosion rates.	Beneficial Effects 1) Provides approximately 2050 activity days or about $4100 in recreation benefits annually. Adverse Effects 1) Average annual cost is estimated to be $3000.	1) Will effect fisheries habitat on approximately 41 miles of stream. 2) Approximately one acre of wildlife habitat will be cleared for parking. 3) Alters landscape quality of the area.	Beneficial Effects 1) Provides approximately 2050 activity days or about $4100 in recreation benefits annually. 2) Will create 1 man year temporary semi-skilled employment and 1 permanent part-time job. Adverse Effects 1) May increase prices on buildable land.	1) Psychological satisfaction from the action. 2) Some landowners may be adverse to the action. 3) Provides for a more equitable distribution of recreation resources. 4) Will create 1 man year temporary semi-skilled employment and 1 permanent part-time job.
9-2) Acquire public access at one or a combination of the following so that at least 20,400 additional user days of recreation will be provided. a) Mill Pond, Sheffield b) Plantain Pond, Mt. Washington c) Stevens Pond, Monterey	Construction of access facilities may cause minor increase in sediment and erosion rates.	Beneficial Effects 1) Provides approximately 20,800 activity days or $41,600 in recreation benefits annually.	1) May effect fish and wildlife habitat on approximately 9 land acres and 200 water surface acres. 2) May alter landscape quality of the area.	Beneficial Effects 1) Provides approximately 20,800 activity days or $41,600 in recreation benefits annually. 2) Will create 3 permanent, part-time semi-skilled jobs.	1) Psychological satisfaction from the action. 2) Will create 3 permanent, part-time semi-skilled jobs. (Unemployment rate is approximately 13%). 3) Some landowners may be adverse to the action. 4) Provides for a more equitable distribution of recreational resources.

MASSACHUSETTS WATER RESOURCES STUDY - BERKSHIRE REGION
TABLE 11-1: ALTERNATIVE ACCOUNTS DISPLAY

ALTERNATIVE	COMPATIBILITY WITH OTHER ALTERNATIVES	NATIONAL ECONOMIC DEVELOPMENT (NED)	ENVIRONMENTAL QUALITY (EQ)	REGIONAL DEVELOPMENT (RD)	SOCIAL WELL-BEING (S W-B)
		Beneficial Effects	Beneficial or Adverse Effects	Beneficial Effects	Beneficial or Adverse Effects
CH. 9 - FISH & WILDLIFE 9-2) continued *d) Harnet Pond, New Marlborough *e) Cheshire Reservoir, Cheshire and Lanesborough * For purposes of this display, a combination of a, b, and c was used.		Adverse Effects 1) Initial cost is estimated to be $41,600. Annual O&M cost is estimated to be $15,600.		Adverse Effects 1) Precludes development on approximately 10 acres. 2) Prices of buildable land may increase as a result of the action.	5) May increase seasonal population.
9-3) Perform forest management to provide a diversity of wildlife habitat.	Is compatible or complementary with all other alternatives.	Beneficial Effects 1) May increase revenues from sporting licenses. 2) Increase forest product production. Adverse Effects 1) Estimated annual cost of a program for implementing this alternative is $5000.	1) Improves quality of wildlife habitat. 2) Improves landscape quality of the area through diversification. 3) May improve quality for some forms of recreation.	Beneficial Effects 1) May increase values on managed and adjacent lands. 2) May result in short term increase in timber production. 3) Increases value of wildlife production in the region. Adverse Effects 1) Estimated annual cost of a program for implementing this alternative is $5000.	1) Psychological satisfaction from the action. 2) Some landowners may be adverse to the action.
9-4) Encourage private landowners to improve wildlife habitat and public access to that habitat.	Is compatible or complementary with all other alternatives.	Beneficial Effects 1) May increase revenues from sporting licenses. 2) May increase the supply of recreation activity days	1) Improves quality of wildlife habitat. 2) Improves landscape quality of the area through diversification. 3) Improves quality of the recreation experience.	Beneficial Effects 1) May increase the supply of recreation activity days in the region. 2) Increases the value of wildlife production in the region.	1) Psychological satisfaction from the action. 2) Some landowners may be adverse to the action. 3) May cause seasonal population influx. 4) Provides a more equitable distribution of recreation resources.

MASSACHUSETTS WATER RESOURCES STUDY - BERKSHIRE REGION
TABLE 11-1: ALTERNATIVE ACCOUNTS DISPLAY

ALTERNATIVE	COMPATIBILITY WITH OTHER ALTERNATIVES	NATIONAL ECONOMIC DEVELOPMENT (NED)	ENVIRONMENTAL QUALITY (EQ)	REGIONAL DEVELOPMENT (RD)	SOCIAL WELL-BEING (S W-B)
		Beneficial Effects	Beneficial or Adverse Effects	Beneficial Effects	Beneficial or Adverse Effects
CH. 9 - FISH & WILDLIFE 9-4) continued		Adverse Effects 1) Estimated annual cost of a program for implementing this alternative is $5000.	4) Public use may reduce quality of wildlife habitat.	Adverse Effects 1) Estimated annual cost of a program for implementing this alternative is $5000. 2) May result in reduced tax revenues or payments to landowners.	
9-5) Acquire and manage 800 acres additional wildlife land.	Is compatible or complementary with all other alternatives.	Beneficial Effects 1) May increase revenues from sporting licenses. 2) Will result in an additional 40,000 activity days or $80,000 in recreation benefits annually. Adverse Effects 1) Initial cost is estimated to be $700,000.	1) Improves the quality of wildlife habitat. 2) Provides a more equitable distribution of wildlife resources. 3) Preserves and protects approximately 800 acres for recreation and wildlife uses.	Beneficial Effects 1) Will increase supply of recreation activity days. 2) Increases the value of wildlife production in the region. 3) Will create 3 permanent part-time semi-skilled jobs. 4) Will result in an additional 40,000 activity days or $80,000 in recreation benefits annually. Adverse Effects 1) Depending on program portion of initial and O&M costs may be borne by towns in the region.	1) Psychological satisfaction from the action. 2) Some landowners may be adverse to the action. 3) May result in seasonal population influx. 4) Provides a more equitable distribution of recreation resources. 5) Will create 3 permanent part-time semi-skilled jobs. (Unemployment rate in region is approximately 13%).

MASSACHUSETTS WATER RESOURCES STUDY - BERKSHIRE REGION
TABLE 11-1: ALTERNATIVE ACCOUNTS DISPLAY

ALTERNATIVE	COMPATIBILITY WITH OTHER ALTERNATIVES	NATIONAL ECONOMIC DEVELOPMENT (NED)	ENVIRONMENTAL QUALITY (EQ)	REGIONAL DEVELOPMENT (RD)	SOCIAL WELL-BEING (S W-B)
		Beneficial Effects	Beneficial or Adverse Effects	Beneficial Effects	Beneficial or Adverse Effects
CH. 9 - FISH & WILDLIFE 9-5) continued				Adverse Effects 2) May increase prices of buildable land. 3) Decrease property tax base.	
9-6) Protect, preserve, and enhance outstanding or unusual wildlife resources.	Is compatible or complementary with all other alternatives.	Beneficial Effects 1) May increase recreation activity days in the future. Adverse Effects 1) Initial cost of program is estimated to be $105,000.	1) Preserves and protects rare and endangered species. 2) Improves quality of the recreation experience.	Beneficial Effects 1) May increase recreation activity days in the future. 2) Will create 3 man years temporary skilled employment. Adverse Effects 1) Depending upon program a portion of the cost may be borne by communities in the region. 2) Decrease property tax base.	1) Psychological satisfaction from the action. 2) Some landowners may be adverse to the action. 3) Will create 3 man years temporary skilled employment. 4) May cause seasonal population influx. 5) More equitable distribution of recreation resources.
CH. 10 - RECREATION 10-1) By 1990 the Massachusetts Division of Forests and Parks should provide: a) 200 additional camp sites at October Mountain State Forest. b) 20 additional camp sites at Mt. Greylock State Reservation. c) 20 additional camp sites at Beartown State Forest.	May reduce quality of wildlife habitat on approximately 30 acres.	Beneficial Effects 1) Will provide an additional 55,000 activity days or about $110,000 in recreation benefits annually.	1) Provides opportunity to modify landscape quality. 2) Creation of 30 acres of camping facilities. 3) Modify 30 acres of forestland by clearing openings for tent sites access and other facilities. 4) May reduce quality of wildlife habitat on approximately 30 acres.	Beneficial Effects 1) Will create 2 permanent semi-skilled jobs. 2) Will create 4 semi-skilled jobs for 1 year. 3) Will create approximately 22,000 activity days or $44,000 in recreation benefits annually to those within the region.	1) Will provide 55,000 activity days for recreational opportunities. 2) Will create 2 permanent semi-skilled jobs. 3) Will create 4 semi-skilled jobs for 1 year. (Unemployment rate in area is approximately 13%).

MASSACHUSETTS WATER RESOURCES STUDY - BERKSHIRE REGION
TABLE 11-1: ALTERNATIVE ACCOUNTS DISPLAY

ALTERNATIVE	COMPATIBILITY WITH OTHER ALTERNATIVES	NATIONAL ECONOMIC DEVELOPMENT (NED)	ENVIRONMENTAL QUALITY (EQ)	REGIONAL DEVELOPMENT (RD)	SOCIAL WELL-BEING (S W-B)
CH. 10 - RECREATION 10-1) continued		Beneficial Effects Adverse Effects 1) Average annual cost including O,M&R of about $84,000. 2) Loss of potential timber harvest on 30 acres of woodland.	Beneficial or Adverse Effects	Beneficial Effects 4) May attract recreation oriented firms. Adverse Effects 1) Loss of potential timber harvest on 30 acres of woodland.	Beneficial or Adverse Effects 4) Provides for a more equitable distribution of recreational resources. 5) Will create seasonal population influx. 6) Psychological satisfaction from the action.
10-2) The Massachusetts Division of Forests and Parks could provide by 1990: a) 100 additional picnic sites at October Mountain State Forest. b) 300 additional picnic sites to be divided among the larger state forests or reservations: Mt. Greylock State Reservation, Bashbish Falls State Forest, Beartown State Forest, Cookson State Forest and Pittsfield State Forest.	May reduce quality of wildlife habitat on approximately 50 acres.	Beneficial Effects 1) Provides an additional 160,000 activity days or about $320,000 in recreation benefits annually. Adverse Effects 1) Average annual cost including O,M&R of about $140,000.	1) Provides opportunity to maintain or increase landscape quality. 2) Creation of 50 acres of picnic facilities. 3) Modifies 50 acres of forestland by clearing for picnic sites. 4) May reduce quality of wildlife habitat on approximately 50 acres.	Beneficial Effects 1) Will create 2 permanent semi-skilled jobs. 2) Will create approximately 80,000 activity days or about $160,000 in recreation benefits annually to those within the region. 3) May attract recreation oriented firms. Adverse Effects 1) Loss of potential timber harvest on 50 acres of woodland.	1) Will provide 160,000 activity days for recreational opportunities. 2) Will create 2 permanent semi-skilled jobs. (Unemployment rate in area is approximately 13%). 3) Provides for more equitable distribution of recreation resources. 4) Will create seasonal population influx. 5) Psychological satisfaction from the action.

MASSACHUSETTS WATER RESOURCES STUDY - BERKSHIRE REGION
TABLE 11-1: ALTERNATIVE ACCOUNTS DISPLAY

ALTERNATIVE	COMPATIBILITY WITH OTHER ALTERNATIVES	NATIONAL ECONOMIC DEVELOPMENT (NED)	ENVIRONMENTAL QUALITY (EQ)	REGIONAL DEVELOPMENT (RD)	SOCIAL WELL-BEING (S W-B)
		Beneficial Effects	Beneficial or Adverse Effects	Beneficial Effects	Beneficial or Adverse Effects
CH. 10 - RECREATION - continued 10-3) The Berkshire-Franklin RC&D Program could install 250 or more picnic sites to be located in public water-based recreation development within the region. Approximately 100 picnic sites could be installed by the cities and towns in community recreation projects other than RC&D projects.	May reduce quality of wildlife habitat on approximately 44 acres.	1) Would create approximately 140,000 activity days or about $280,000 in recreation benefits annually. Adverse Effects 1) Average annual cost including O,M&R of about $105,000.	1) Provides opportunity to maintain or increase landscape quality. 2) Creation of 44 acres of picnic facilities. 3) Changes land use on 44 acres. 4) Preserves 44 acres of previously unprotected land for public use. 5) May reduce quality of wildlife habitat on approximately 44 acres.	1) Will create 2 permanent semi-skilled jobs. 2) Will create approximately 70,000 activity days or about $140,000 in recreation benefits annually to those within the region. 3) May attract recreation oriented firms. Adverse Effects 1) Approximately 44 acres will be unavailable for commercial, industrial or residential development. 2) Prices of buildable land may increase and adversely effect economic activity.	1) Will provide approximately 140,000 activity days for recreational opportunities. 2) Will create 2 permanent semi-skilled jobs. (Unemployment rate in area is approximately 13%). 3) Provides for a more equitable distribution of recreation resources. 4) Will create seasonal population influx. 5) Psychological satis - faction from the action. 6) Some landowners may be adverse to the action.

MASSACHUSETTS WATER RESOURCES STUDY - BERKSHIRE REGION
TABLE 11-1: ALTERNATIVE ACCOUNTS DISPLAY

ALTERNATIVE	COMPATIBILITY WITH OTHER ALTERNATIVES	NATIONAL ECONOMIC DEVELOPMENT (NED)	ENVIRONMENTAL QUALITY (EQ)	REGIONAL DEVELOPMENT (RD)	SOCIAL WELL-BEING (S W-B)
		Beneficial Effects	Beneficial or Adverse Effects	Beneficial Effects	Beneficial or Adverse Effects
CH. 10 - RECREATION continued 10-4) Expansion of existing swimming beaches, presently operated by communities, as follows: a) Onota Lake, Pittsfield, 1000 lin.ft. (40,000 sq. ft.) b) Pontoosuc Lake, Pittsfield, 500 lin.ft. (20,000 sq. ft.) c) Laurel Lake, Lee, 600 lin.ft. (24,000 sq. ft.) d) Windsor Lake, North Adams, 600 lin.ft. (24,000 sq. ft.) e) Lake Mansfield, Great Barrington, 300 lin.ft. (12,000 sq. ft.)	May reduce wildlife habitation approximately 12 land-acres and disturb fisheries habitat on approximately 3 water-surface acres.	1) Provides an additional 180,000 activity days or $360,000 in recreation benefits annually. Adverse Effects 1) Average annual cost including O,M&R of $190,600.	1) Provides opportunity to modify landscape quality. 2) Creation of 12 acres of swimming facility. 3) Changes land use on 12 acres. 4) May have impact on water quality. 5) May reduce wildlife habitat on approximately 12 land-acres and disturb fisheries habitat on approximately 3 water-surface acres.	1) Will create 10 part-time semi-skilled jobs. 2) Provides approximately 108,000 activity days or about $216,000 in recreation benefits to those within the region. 3) May attract recreation oriented firms. Adverse Effects	1) Will provide 180,000 activity days for recreation opportunities. 2) Will create 10 part-time semi-skilled jobs. (Unemployment rate in area is approximately 13%). 3) Provides for a more equitable distribution of recreation resources. 4) Will create seasonal population influx. 5) Psychological satisfaction from the action. 6) Some landowners may be adverse to the action.
10-5) Provision of beaches at these existing ponds or at ponds under construction: a) Center Pond, Dalton 500 lin.ft. (20,000 sq. ft.) b) Washington Mountain Lake, Washington, 1,000 lin.ft. (40,000 sq. ft.) c) Cheshire Reservoir, Cheshire and Lanesborough, 1,000 lin.ft. (40,000 sq. ft.)	May produce wildlife habitat on approximately 10 land-acres and disturb fisheries habitat on approximately 2½ water-surface acres.	Beneficial Effects 1) Provides an additional 150,000 activity days or $300,000 in recreation benefits annually. Adverse Effects 1) Average annual cost including O,M&R of $160,400.	1) Provides opportunity to modify landscape quality. 2) Creation of 10 acres of swimming facility. 3) Changes land use on 10 acres. 4) May have impact on water quality. 5) May reduce wildlife habitat on approximately 10 land-acres and disturb fisheries habitat on approximately 2½ water-acres.	Beneficial Effects 1) Will create 8 part-time semi-skilled jobs. 2) Provides approximately 90,000 activity days or about $180,000 in recreation benefits to those within the region. 3) May attract recreation oriented firms. Adverse Effects	1) Will provide 150,000 activity days for recreation opportunities. 2) Will create 8 part-time semi-skilled jobs. (Unemployment rate in area is approximately 13%). 3) Provides for a more equitable distribution of recreation resources. 4) Will create seasonal population influx.

MASSACHUSETTS WATER RESOURCES STUDY - BERKSHIRE REGION
TABLE 11-1: ALTERNATIVE ACCOUNTS DISPLAY

ALTERNATIVE	COMPATIBILITY WITH OTHER ALTERNATIVES	NATIONAL ECONOMIC DEVELOPMENT (NED)	ENVIRONMENTAL QUALITY (EQ)	REGIONAL DEVELOPMENT (RD)	SOCIAL WELL-BEING (S W-B)
CH. 10 - RECREATION 10-5) continued		Beneficial Effects	Beneficial or Adverse Effects	Beneficial Effects	Beneficial or Adverse Effects 5) Psychological satisfaction from the action. 6) Some landowners may be adverse to the action.
10-6 & 10-8) Construction of 3000 lin.ft. of beach, provisions for boating and fishing through construction of reservoir sites HO-908, HO-1205, HO-1208, and HO-1406.	Will change wildlife habitat on approximately 968 acres.	Beneficial Effects 1) Provides an additional 180,000 swimming activity days and 66,600 fishing and boating activity days or a total of $493,200 in recreation benefits annually. Adverse Effects 1) Average annual cost including O,M&R of $427,500.	1) Provides opportunity to modify landscape quality. 2) Creation of 970 acres (950 acre water and 16 acres of land) recreational facility. 3) Will effect low-flow regime. 4) Will create 952 acres of fisheries habitat (138 acres cold water and 814 acres warm water). 5) Construction activity will temporarily increase erosion rates and noise and water pollution. 6) Irreversible commitment of 950 acres of land. 7) Boating and swimming may adversely affect water.	Beneficial Effects 1) Will create 12 part-time semi-skilled jobs. 2) Provides approximately 108,000 swimming activity days or $40,000. 3) May attract recreation oriented firms. 4) Will create 90 man years temporary full time employment during construction. Adverse Effects 1) Approximately 970 acres will be unavailable for commercial, industrial or residential development. 2) Prices of buildable land may increase, adversely effecting commercial and industrial activity.	1) Will provide 246,600 activity days for recreation opportunities. 2) Will create 12 part-time semi-skilled jobs. (Unemployment rate in area is approximately 13%). 3) Provides for a more equitable distribution of recreation resources. 4) Will create seasonal population influx. 5) Psychological satisfaction from the action. 6) Some landowners may be adverse to the action. 7) Will create 90 man years temporary full time employment during construction.

MASSACHUSETTS WATER RESOURCES STUDY - BERKSHIRE REGION
TABLE 11-1: ALTERNATIVE ACCOUNTS DISPLAY

ALTERNATIVE	COMPATIBILITY WITH OTHER ALTERNATIVES	NATIONAL ECONOMIC DEVELOPMENT (NED)	ENVIRONMENTAL QUALITY (EQ)	REGIONAL DEVELOPMENT (RD)	SOCIAL WELL-BEING (S W-B)
		Beneficial Effects	Beneficial or Adverse Effects	Beneficial Effects	Beneficial or Adverse Effects
CH. 10 - RECREATION continued 10-7) Construct public access ramps for boating at: a) Onota Lake, Pittsfield b) Cheshire Reservoir, Cheshire and Lanesborough c) Ashmere Lake, Hinsdale d) Goose and Upper Goose Ponds, Lee and Tyringham e) Lake Garfield, Monterey f) Mill Pond, Sheffield	May disturb fisheries habitat in immediate area of launching sites.	1) Provides an additional 66,000 activity days or about $132,000in recreation benefits annually. Adverse Effects 1) Average annual cost including O,M&R of about $13,700.	1) Creation of 3 acres of boating facilities. 2) Higher turbidity levels are expected during construction. 3) May disturb fisheries habitat in immediate area of launching sites. 4) Additional recreation use may adversely affect water quality.	1) Will create approximately 5 man years temporary employment during construction. 2) Will create approximately 33,000 activity days or $66,000 in recreation benefits annually for those within the region. 3) May attract recreation oriented firms. Adverse Effects	1) Will provide 66,000 activity days for recreation opportunities. 2) Will create approximately 5 man years temporary employment during construction. (Unemployment rate in area is about 13%). 3) Provides for a more equitable distribution of recreation resources. 4) Will create a seasonal population influx. 5) Psychological satisfaction from the action. 6) Landowners may be adverse to the action.

MASSACHUSETTS WATER RESOURCES STUDY - BERKSHIRE REGION
TABLE 11-1: ALTERNATIVE ACCOUNTS DISPLAY

ALTERNATIVE	COMPATIBILITY WITH OTHER ALTERNATIVES	NATIONAL ECONOMIC DEVELOPMENT (NED)	ENVIRONMENTAL QUALITY (EQ)	REGIONAL DEVELOPMENT (RD)	SOCIAL WELL-BEING (S W-B)
10-9) Establishment of a recreational corridor to include 3 boat ramps, 5 picnic areas, and purchase or easement of 200 acres of land bordering the Housatonic River from Risingdale in Great Barrington to Andrus Rd. in Sheffield, Mass.	1) May disturb fisheries during construction of boat launches. 2) May reduce quality of wildlife habitat on about 200 acres.	Beneficial Effects 1) Provides 21,200 boating and fishing activity days and 50,000 hiking and nature study activity days or about $142,400 in recreation benefits annually. Adverse Effects 1) Avg. annual cost including O, M&R of about $25,000. 2) Loss of production on about 50 acres of agricultural land.	Beneficial or Adverse Effects 1) May increase turbidity during ramp construction. 2) Creation of 200 acres of recreation land. 3) May disturb fisheries during construction of boat launches. 4) May reduce quality of wildlife habitat on about 200 acres.	Beneficial Effects 1) Provides 12,700 boating and fishing activity days, and 30,000 hiking and nature study activity days or about $85,400 in recreation benefits annually. 2) Will create 1 permanent part-time semi-skilled job and 5 man yrs. temporary employment during construction. 3) May attract recreation oriented firms. Adverse Effects 1) Loss of production on about 50 acres of agricultural land.	Beneficial or Adverse Effects 1) Will provide 71,200 activity days for recreation opportunities. 2) Will create 1 permanent part-time semi-skilled job and 5 man yrs. temporary employment during construction. (Unemployment rate in area is approx. 13%). 3) Provides for a more equitable distribution of recreation resources. 4) Will create seasonal population influx. 5) Psychological satisfaction from the action. 6) Some landowners may be adverse to the action.

MASSACHUSETTS WATER RESOURCES STUDY - BERKSHIRE REGION
TABLE 11-1: ALTERNATIVE ACCOUNTS DISPLAY

ALTERNATIVE	COMPATIBILITY WITH OTHER ALTERNATIVES	NATIONAL ECONOMIC DEVELOPMENT (NED)	ENVIRONMENTAL QUALITY (EQ)	REGIONAL DEVELOPMENT (RD)	SOCIAL WELL-BEING (S W-B)
		Beneficial Effects	Beneficial or Adverse Effects	Beneficial Effects	Beneficial or Adverse Effects
10-10) Establish a regional program for protection of unique natural areas.	1) Is compatible or complementary to all other alternatives.	1) Preservation of unique natural areas will help maintain attractiveness of region for tourists and other recreation users. Adverse Effects 1) Annual operation budget for program of $2,000. 2) Costs involved in implementing program.	1) Preservation of unique natural areas would be monitored by region residents. This will contribute to preservation of those areas not considered "safe indefinitely".	1) Creates 1 skilled temporary part-time job. 2) Economic value to the region of each area would be identified. 3) Maintain attraction of area for tourists and other recreation use. Adverse Effects 1) Recommendations made may preclude commercial, industrial, or residential development in certain areas.	1) Action would increase public awareness. 2) Psychological satisfaction from the action. 3) Landowners may be adverse to some recommendations. 4) Create 1 skilled temporary part-time job. (Unemployment in area is 13%).

MASSACHUSETTS WATER RESOURCES STUDY - BERKSHIRE REGION
TABLE 11-1: ALTERNATIVE ACCOUNTS DISPLAY

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10-11) Designation of the following river reaches as components of the Mass. Scenic and Recreational Rivers System (Mass. General Laws, Chapter 21, Section 17B). a) The Housatonic River from the Risingdale Dam in Great Barrington to the Conn. State Line (approx. 25 miles). b) The Williams River from the Mass. Turnpike in West Stockbridge to the confluence with the Housatonic River in Great Barrington (approx. 10 miles). c) The West branch of the Green River to the confluence with the main stem Green River and the Green River from this confluence to Sweets Corner, Williamstown (approx. 5 miles).	1) Is complementary or compatible with all other alternatives.	Beneficial Effects 1) Positive step in initiating future alternatives of economic significance. Adverse Effects 1) Avg. annual cost of administering and enforcing the program is est. to be $3,000.	Beneficial or Adverse Effects 1) Maintains present water quality. 2) Insures preservation of stream character. 3) Positive step in initiating future environmental alternatives.	Beneficial Effects 1) Provides 1 skilled temporary part-time job. Adverse Effects 1) Prices of buildable land may go up which may adversely effect industrial and commercial activity.	Beneficial or Adverse Effects 1) Psychological satisfaction from the action. 2) Some landowners may be adverse to the action. 3) Provides 1 skilled temporary part-time job. (Unemployment rate in this area is 13%).

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TABLE 11-1: ALTERNATIVE ACCOUNTS DISPLAY

ALTERNATIVE	COMPATIBILITY WITH OTHER ALTERNATIVES	NATIONAL ECONOMIC DEVELOPMENT (NED)	ENVIRONMENTAL QUALITY (EQ)	REGIONAL DEVELOPMENT (RD)	SOCIAL WELL-BEING (S W-B)
		Beneficial Effects	Beneficial or Adverse Effects	Beneficial Effects	Beneficial or Adverse Effects
10-12) Investigation of the feasibility of transporting inner city residents of the Springfield-Chicopee-Holyoke, Mass. area to state and other recreational facilities of the Berkshire Region.	1) Will increase demand on existing recreational facilities and could require increases in quantities of facilities called for in Alternatives 10-1, 2, 3, 4, 5, 6, 7, & 8.	1) May increase recreational activity days in the future. Adverse Effects 1) Cost of study estimated to be $5,000.			1) May provide additional recreational opportunities for inner city residents. 2) May provide for a more equitable distribution of recreational resources. 3) May create seasonal population influx. 4) Psychological satisfaction from the action.

CHAPTER 12 - ENVIRONMENTAL EFFECTS

This report presents 36 alternatives for the management, conservation or development of the water and related land resources of the Berkshire Region. These alternatives resulted from a planning process which was modeled after the Principles and Standards for Planning established by the U.S. Water Resources Council. The results of the Massachusetts Water Resources Study will be used by the Massachusetts Water Resources Commission in its development of the State Water and Related Land Resource Plan.

The alternatives are based on analyses of existing conditions and programs and compliment ongoing programs in meeting 1990 resource needs.

Table 12-1, Potential Environmental Impacts of Alternatives, summarizes the potential impacts that suggested alternatives may have upon fifteen key environmental factors. It also includes an assessment of the irreversible or irretrievable commitment of resources resulting from each altnerative. Effects on air quality, migration routes and archeological and historic resources were also considered. The alternatives are not expected to have a significant impact on air quality or migration routes. Archeological and historic resources cannot be assessed at this level of investigation. Structural alternatives, such as Alternative 8-2, surface water reservoirs for water supply, could result in an adverse impact upon archeological and historic resources. Such impacts would have to be evaluated during final planning stages.

Expected impact on each environmental factor is indicated by (+) when the alternative maintains or improves the situation, (-) when the alternative has a negative impact, and (0) when an alternative has both favorable and adverse impacts and/or has significant impacts, for which an adequate determination cannot be made at this time. No entry indicates that no significant impact is expected.

This table represents our best judgement on possible effects based on all available information. It is expected that detailed planning of any alternative will investigate the significant environmental impacts indicated on this table.

TABLE 12.1 - POTENTIAL ENVIRONMENTAL IMPACTS OF ALTERNATIVES

SIGNIFICANT ENVIRONMENTAL IMPACTS ON: 1/

ALTERNATIVES	Erosion & Sed-mentation	Water Table Changes	Changes Flow Regime	Changes Land Use	Upland Wild-life Habitat	Bottomland WL Habitat	Bottomland Hardwoods	Stream Fisheries	Wetlands	Rare or Endangered Animal, Plants	Intermittent Streams	Perennial Streams	Water Quality	Water Quality Incld. Receiv-ing Water	Appearance of the Landscape	Irreversible & Irretrievable Commitment of Resources 2/
3-1 Preserve Agricultural Land	0			+	+	+								0	+	+
3-2 Forestry - Increased Timber Production	_		0	+	+	+	+	0	0	0	0		0	0	0	+
3-3 Forestry - Multiple Use	-		+	+	+	+	+	0	0	0	0		0	0	+	+
3-4 Forestry - Preserve Forest Lands	+			+	-	-	0	+	+	+	+		0	0	0	+
4-1 Flood Insurance	+		+	+		+	+	+	+			+	+	+	0	+
4-2 Structural Flood Protection Program	0	0	0	0	0	0	0	-	0			-	0	0	0	-
4-3 Flood proofing									0			-	+	0	0	-
4-4 Structural & Flood proofing	0	0	0	0	0	0	0	-	0			-	0	0	0	-
5-1 E&S Control Ordn.	+				+	+	+	+	+		+	+		+	+	+
5-2 RC&D Critical Area Restoration	+				+	+	+	+	+		+	+		+	+	+
5-3 Stream Buffer Zones	+				+	+	+	+	+	+	+	+		+	+	+
6-1 Wetland Delineation		+	+	+	+	+	+	+	+		+	+	+	+	+	+
6-2 Regional Organization		+	+	+	+	+	+	+	+		+	+	+	+	+	+
6-3 Wetlands Acquisition		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
7-1 Soil Survey - 5 towns	+	+		+	+	+	+	+	+		+	+	+	+	+	+
7-2 Lake Water Quality Program	+	+	+	+	+	+	+	+	+			+	0	+	+	-
8-1 Ground Water Supply		-	-	0		0	0	-	-		-	-	-	-	0	+
8-2 Surface Reservoir Supply	0	-	-	0	0	-	-	-	-			-	0	0	0	-
9-1 Public Access-Streams				+		+	+	+	+			+		-	+	+
9-2 Public Access-Lakes & Ponds	-				-	-	-	+					-	-	0	+
9-3 Forest Management for Wildlife	0				+	+	+	+		+				0	+	+
9-4 Encourage Private, Habitat				+	+	+	+	+	+	+					+	+
9-5 Acquisition WL Habitat				+	+	+	+	+	+	+	+	+	+	+	+	+
9-6 Protect, Preserve Outstanding WL Resources				+	+	+	+	+	+	+	+	+	+	+	+	+
10-1 Additional Camp Sites	-			0	-			0						-	0	+
10-2 Picnicking- F&P	-			0	-	-		0						0	0	+
10-3 Picnicking-by Others	-			0	-	-		0						0	0	+
10-4 Expand Existing Beaches	-			0	-	-	-							-	0	+
10-5 Provide New Beaches	-			0	-	-	-							-	0	+
10-6 Provide Beach At New Impoundments	-			0	-	-	-							0	0	-
10-7 Construct Lake Access Ramps	-			0	-	-	-	0						-	-	+
10-8 Reservoir Construction	0	-	0	0	0	-	-	-	-		-	-	0	0	0	-
10-9 Housatonic Recreation Corridor	+			+		+	0	+	0			+		0	0	+
10-10 Committee to Protect Unique Natural Areas				+						+					+	+
10-11 Massachusetts Scenic Recreation Rivers	+	+	+	+		+	+	+	+			+		+	+	+
10-12 Study -- Transporting to Recreational Facilities																+

1/ + Maintains or improves present situation. - Adverse Impact Expected. 0 Could have adverse and/or favorable impact. Blank No significant impact is expected.

2/ + No irreversible or irretrievable commitment of resources. - Involves an irreversible and irretrievable commitment of resources.

APPENDIX A - HYDROLOGIC DATA

During the investigation of flooding problems in the Berkshire Region, the Soil Conservation Service has generated a great deal of hydrologic data necessary to analyze flood damages. A summary of the data is presented in this appendix. This information may be useful in future investigations, flood plain delineations, and other studies.

The inventory of flood control projects and related studies contains information concerning projects or studies which are completed or underway. The inventory serves to outline the major water resources studies which have included the Berkshire Region. Flood control projects which affect the region are also summarized.

Detailed hydrologic data are presented in Plates 1 through 11. The data include flood profiles at selected locations, information for selected stream crossings and dams, as well as drainage area and historical stream gage information.

Inventory of Flood Control Projects and Related Studies

Item numbers, where indicated, refer to the project or study location on Plates 1 or 8.

WASHINGTON MOUNTAIN BROOK WATERSHED PROTECTION AND FLOOD PREVENTION PROJECT (ITEM NO. 1)

In August 1967, the Berkshire Conservation District, town of Lee, and Massachusetts Department of Natural Resources prepared a Watershed Plan for the Washington Mountain Brook Watershed within the towns of Lee, Washington, and Becket. A general description of the governing watershed program under PL-566 is presented in Chapter 11.

The basic flood prevention ingredients in the plan include three floodwater retarding structures and several hundred feet of channel modification. These features will eliminate most damages from the 100-year storm and reduce average annual damages by over $21,000 (1967 price base).

Construction work on this project began in the fall of 1972. One structure has been completed and other work is underway.

SHEFFIELD CHANNEL IMPROVEMENT (ITEM NO. 2)

The Massachusetts Department of Public Works, Division of Waterways under the authority of Chapter 91, of the General Laws can provide for the improvement, development, maintenance, and protection of rivers and streams within the Berkshire Region.

About 1,850 feet of stream channel improvement was installed in 1973 by the Department of Public Works to straighten the Housatonic River immediately above Kellogg Road in Sheffield. The purpose of the work was to halt the serious cutting and undermining of Kellogg Road at its intersection with U.S. Route 7 and redirect flow through the bridge.

This is the most notable recent Chapter 91 improvement in the region. About 15 such projects have been completed in the last 30 years, mostly in the 1940's in Pittsfield.

UPPER HOUSATONIC RIVER FLOOD HAZARD ANALYSES (ITEM NO. 3)

prepared by the USDA, Soil Conservation Service. This report provides flood hazard information concerning past flooding and the extent and depth of possible future flooding. It can be used by state and local governments in assessing flood problems and determining actions needed for the judicious use of land in and adjacent to the flood plain.

The 100-year flood plain, covering 4,150 acres exclusive of the normal surface areas of major ponds and lakes, represents flood plain delineations on 33 miles of streams in Pittsfield, Dalton, Hinsdale, Lanesborough, and Richmond.

HOUSATONIC RIVER FLOOD PLAIN DELINEATION STUDY (ITEM NO. 4)

Robert G. Brown and Associates, Inc. of Lee, Massachusetts has completed a wetlands identification and flood plain delineation study in Lenox, Lee, Stockbridge, and Great Barrington. This project was funded by grants from

the Ford Foundation, the Housatonic River Watershed Association, and the Conservation Commissions of the respective towns. The purpose of the project was to supply the towns with information for planning with regard to the protection of wetlands and to aid in the implementation of flood plain zoning along the Housatonic River and some of its major tributaries.

The Brown Associates engineering firm has mapped the wetlands of the four towns and has classified each wetland according to its physical and biological characteristics. The flood plain of the Housatonic River has been delineated utilizing the hydrologic data prepared by the Soil Conservation Service and included in Appendix A of this report. Aerial photography, photographs, and records of historical floods were used to supplement the hydrologic information.

SHEFFIELD FLOOD PLAIN INFORMATION STUDY (ITEM NO. 5)
The U. S. Army Corps of Engineers completed a flood plain identification study along the Housatonic River, Hubbard and Schenob Brooks, in Sheffield. This study identifies potential flood problem areas within the town and discusses the nonstructural alternative solutions.

BASHBISH STREAMBANK PROTECTION: (BERKSHIRE-FRANKLIN RESOURCE CONSERVATION & DEVELOPMENT PROJECT) (ITEM NO. 6)
In the past, flood damage to Falls Road has resulted in several thousand dollars in repair costs and has prevented access to Bashbish Falls State Forest for periods of up to several months. This RC&D project provides for the alleviation of such future problems through adequate streambank protection measures. The project is now in the design stage. The RC&D program is described in Chapter 11.

ADAMS LOCAL PROTECTION PROJECT (ITEM NO. 7)
After heavy damage from the storms of 1938 and 1948-49, the U. S. Army Corps of Engineers began installation of a local protection project in Adams. This project consists of a series of floodwalls, earth levees, stilling basins, concrete channels, and other measures designed to reduce flood damage. The total channel improvement reach covers a distance of about 2.2 miles from Lime Street to Commercial Street and was installed at a cost of $7,937,000.

Work was completed in 1960 and protects an area containing 4 major industries, 125 commercial firms, 500 residences, and 2 public buildings.

NORTH ADAMS LOCAL PROTECTION PROJECT (ITEM NO. 8)

In addition to the Adams local protection project described above, the Corps of Engineers has also installed a local protection project in North Adams. With the installation of the same basic types of measures as in the Adams project, these prevention measures protect about 25 percent of the city's commercial and industrial firms and about 25 percent of its residences. The project was completed in 1962 at a total cost of $18,752,000 and to date has prevented about $1,320,0001/ in damage. It is estimated that this project would prevent damage in excess of 11.6 million dollars in a recurrence of the September 1938 flood.1/

NORTH ADAMS FLOOD PLAIN INFORMATION STUDY (ITEM NO. 9)

This report discusses the flood plain characteristics and general flood situation for 2.5 miles of the Hoosic River between the Adams and North Adams local protection projects. It indicates that the flood plain within this reach is subject to both flooding and future development. This report also concerns itself with decisions needed for controlling flood plain development. Copies of this 1970 report are available at the North Adams City Hall.

WILLIAMSTOWN FLOOD PLAIN INFORMATION STUDY (ITEM NO. 10)

This study covers 4.4 miles of the Hoosic River and 6.0 miles of the Green River within Williamstown. It indicates the extent of past flooding and possible future flooding within the town. Copies of this 1970 report are available at the Williamstown Town Hall.

1/ Water Resources Development in Massachusetts, U.S. Army Corps of Engineers, New England Division, Waltham, Massachusetts, 1971.

WILLIAMSTOWN FLOOD INSURANCE STUDY (ITEM NO. 11)

Williamstown is the first community in the Berkshire Region to obtain flood plain insurance based on the identification of their flood hazard areas. The Federal Insurance Administration, Department of Housing and Urban Development, has contracted with the Corps of Engineers to provide detailed flood hazard maps and data for establishing insurance rates. Preliminary flood hazard maps were prepared in June 1973 and are available at the Williamstown Town Hall.

GREEN RIVER PRELIMINARY INVESTIGATION (ITEM NO. 12)

In a preliminary investigation of flood problems on Green River Watershed completed in 1971 by the SCS, it was determined that flood water retarding structures and channel improvements could be installed to reduce flood damages. These measures are not the only alternatives for alleviating flood problems, but do indicate that a project in the Green River Watershed is feasible under the Watershed Protection and Flood Prevention Act (PL-566). Due to lack of public support, a watershed plan for the project has not been prepared, but it remains a future possibility should public interest develop.

HUDSON BROOK PRELIMINARY INVESTIGATION (ITEM NO. 13)

In May 1972, the SCS completed a preliminary investigation of flood problems within the Hudson Brook Watershed. It was concluded from this investigation that the cost of proposed flood prevention measures far exceeded potential benefits. Therefore, the watershed was not eligible for cost sharing under PL-566.

KINDERHOOK CREEK BASIN SURVEY FOR FLOOD CONTROL (ITEM NO. 14)

In October of 1971, the U. S. Army Corps of Engineers completed a Survey Report for Flood Control for the entire Kinderhook Creek Basin in New York and Massachusetts. A thorough study was made of flood problems within the Kinderhook Creek portion of the Berkshire Region. The report

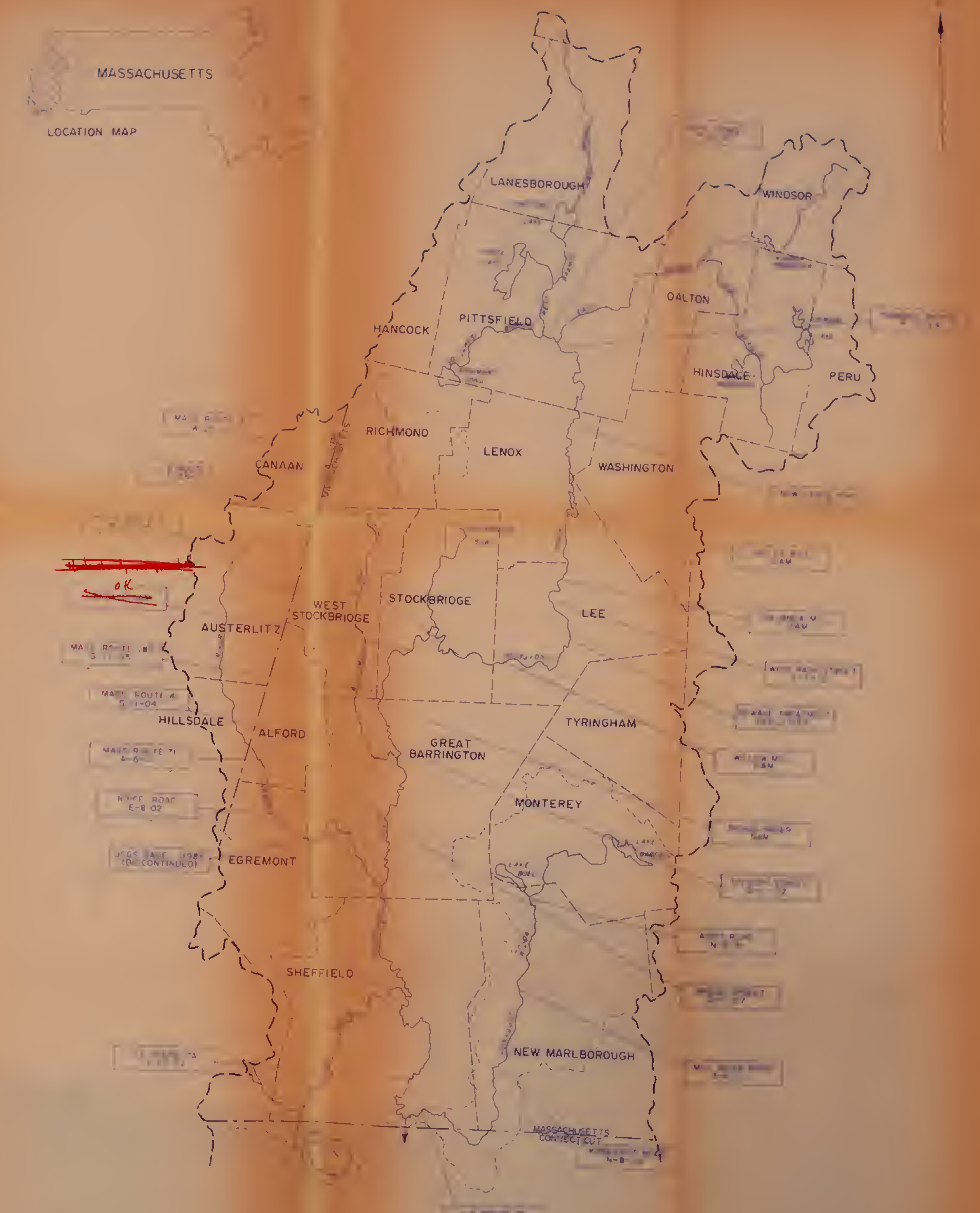
concluded that protection projects were unfeasible and that the most appropriate flood plain management plan for the area would involve a combination of flood plain regulation, floodproofing, evacuation, flood warning, and flood insurance.

HOOSIC RIVER BASIN SURVEY

The U. S. Army Corps of Engineers has been authorized to conduct a survey study for the entire Hoosic River Basin in the interests of flood control, water supply, wastewater management, and related water resource needs. An interim survey report for flood control in Adams and North Adams will be prepared. This interim report will concentrate primarily on the need for extending the Adams local protection project to the North Adams city line.

HUDSON RIVER BASIN COMPREHENSIVE STUDY (LEVEL B)

This reconnaisance level study, approved and funded by the Water Resources Council, is underway. The objectives of the study will be to recommend actions which will secure for the local people the full range of uses and benefits that can be provided through the balanced concentration and development of the basin's water and related land resources. The study will be conducted by several state and federal agencies under the general direction of the Hudson River Basin Coordinating Committee which will consist of at least one representative from each of the five basin states.



LEGEND

- TOWN BOUNDARY
- STATE BOUNDARY
- WATERSHED BOUNDARY
- SUB-WATERSHED BOUNDARY
- SELECTED KEY LOCATIONS
- HOUSATONIC RIVER & MAJOR STREAMS

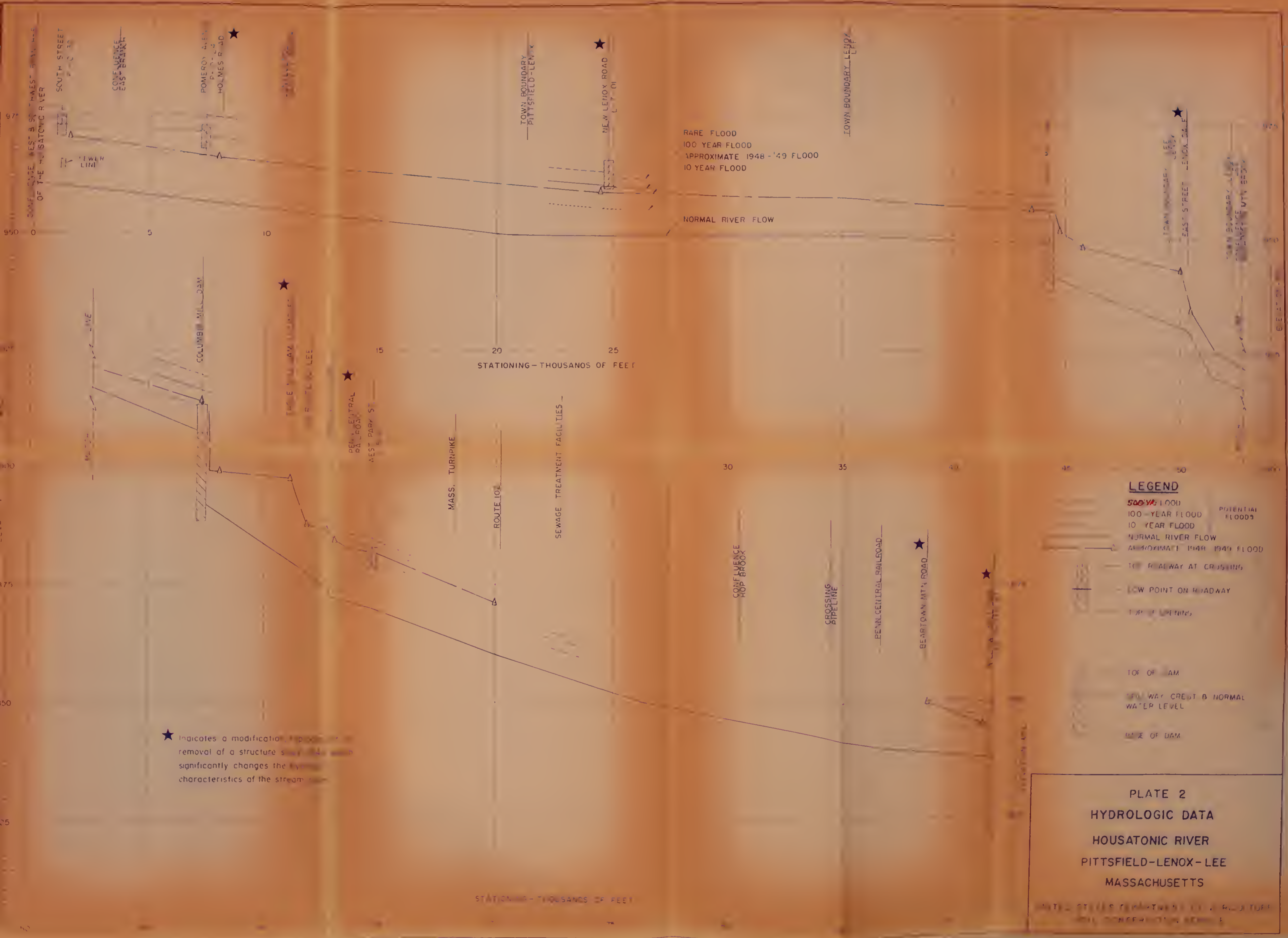
PLATE 1

INDEX MAP TO HYDROLOGIC DATA

HOUSATONIC RIVER BASIN

MASSACHUSETTS

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE


SOUTH STREET
POMEROY AVE
HOLMES ROAD
TOWN BOUNDARY PITTSFIELD-LENOX
NEW LENOX ROAD
TOWN BOUNDARY LENOX-LEE
RARE FLOOD
100 YEAR FLOOD
APPROXIMATE 1948 - '49 FLOOD
10 YEAR FLOOD
NORMAL RIVER FLOW
EAST STREET
COLUMBIA MILL DAM
PENN CENTRAL RAILROAD
WEST PARK ST
MASS. TURNPIKE
ROUTE 102
SEWAGE TREATMENT FACILITIES
CONFLUENCE HOP BROOK
CROSSING PIPELINE
PENN CENTRAL RAILROAD
BEARTOWN MT'N ROAD
STATIONING - THOUSANDS OF FEET
LEGEND
500 YR FLOOD
100 - YEAR FLOOD
10 YEAR FLOOD
POTENTIAL FLOODS
NORMAL RIVER FLOW
APPROXIMATE 1948 - 1949 FLOOD
TOP ROADWAY AT CROSSING
LOW POINT ON ROADWAY
TOP OF OPENING
TOP OF DAM
SPILLWAY CREST & NORMAL WATER LEVEL
BASE OF DAM
Indicates a modification, ... or removal of a structure ... which significantly changes the ... characteristics of the stream ...
PLATE 2
HYDROLOGIC DATA
HOUSATONIC RIVER
PITTSFIELD-LENOX-LEE
MASSACHUSETTS
UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

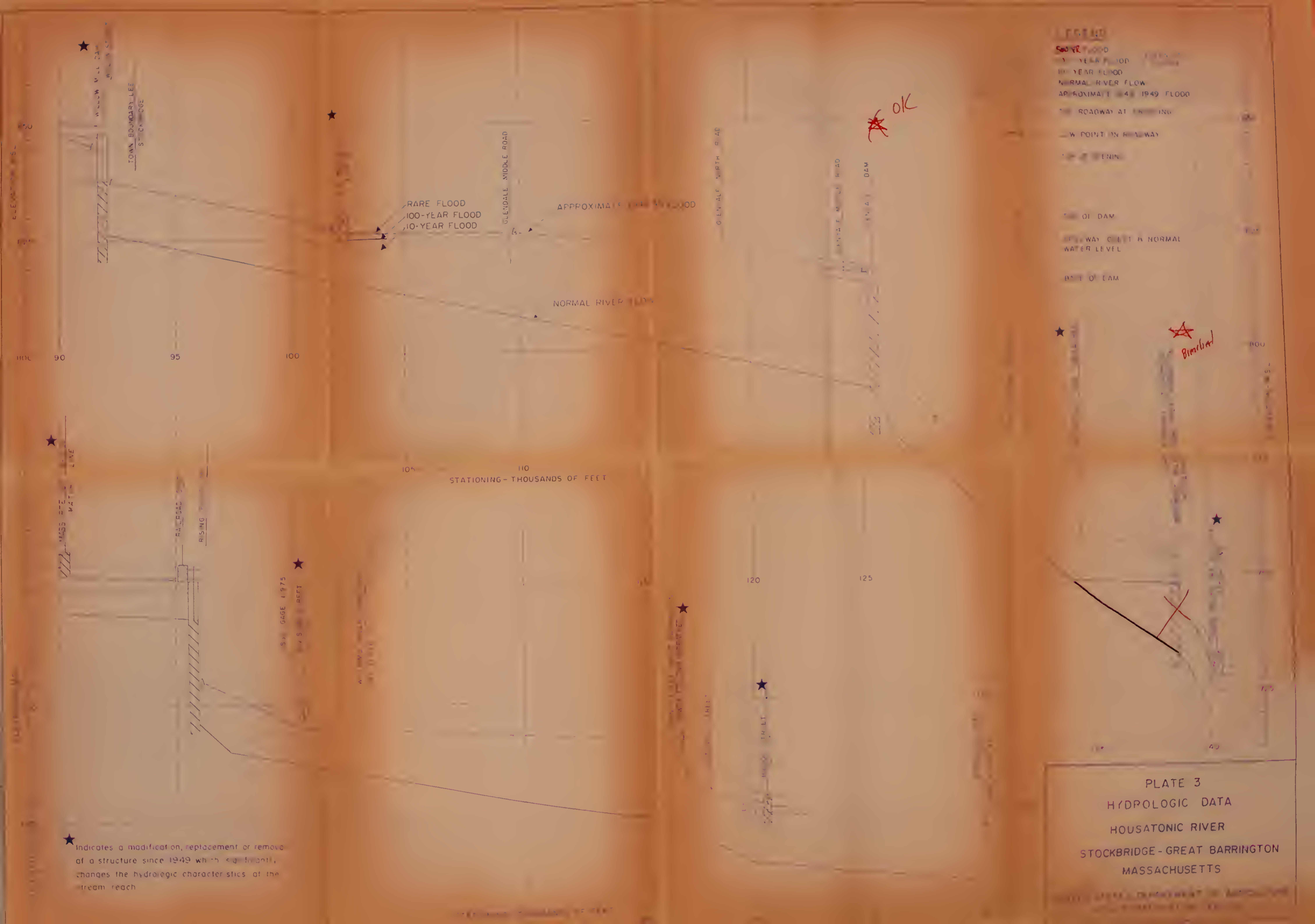


PLATE 3
HYDROLOGIC DATA
HOUSATONIC RIVER
STOCKBRIDGE - GREAT BARRINGTON
MASSACHUSETTS

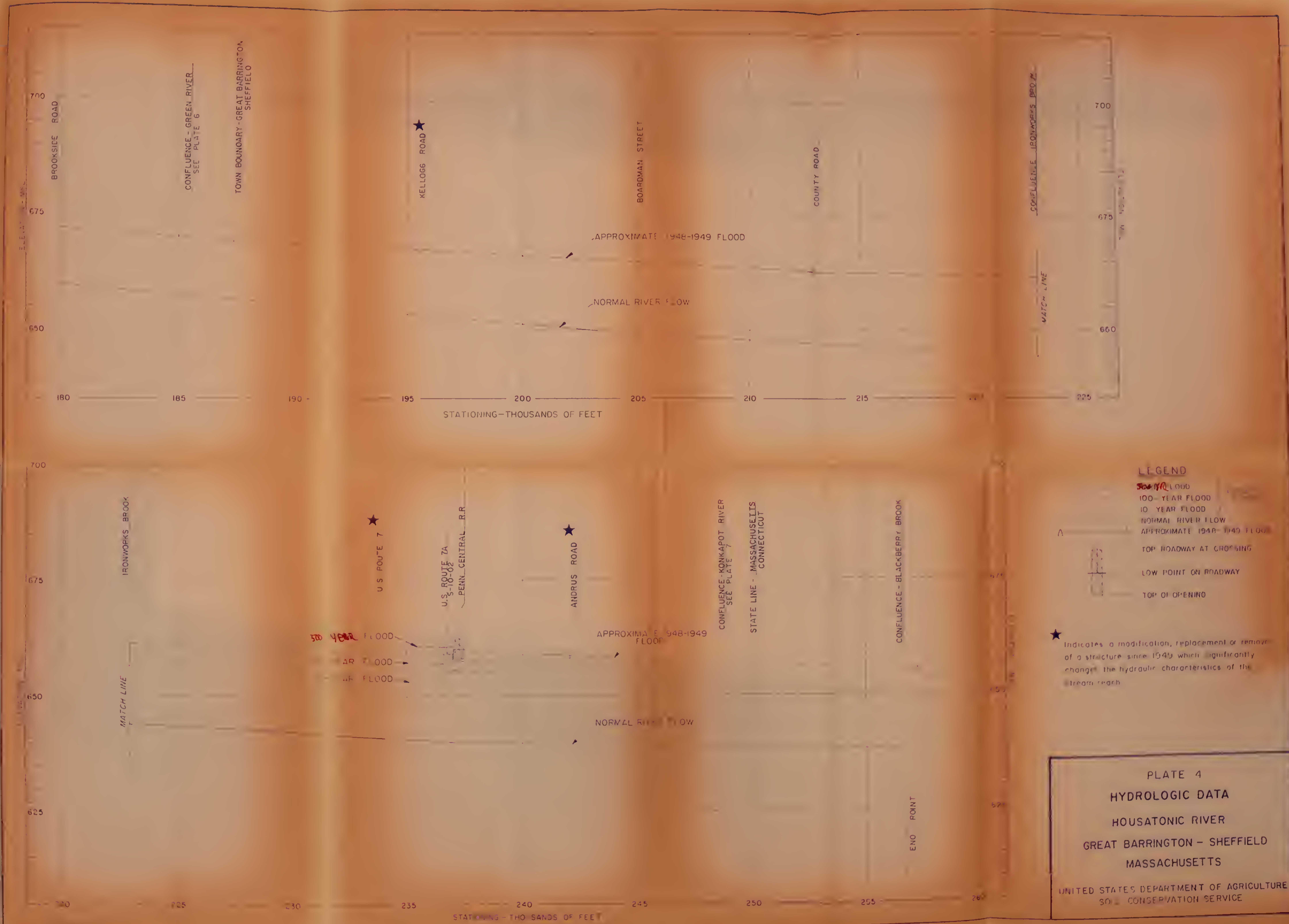


PLATE 4
HYDROLOGIC DATA
HOUSATONIC RIVER
GREAT BARRINGTON – SHEFFIELD
MASSACHUSETTS

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

PLATE 5

HYDROLOGIC DATA

WILLIAMS RIVER

WEST STOCKBRIDGE – GREAT BARRINGTON

MASSACHUSETTS

UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

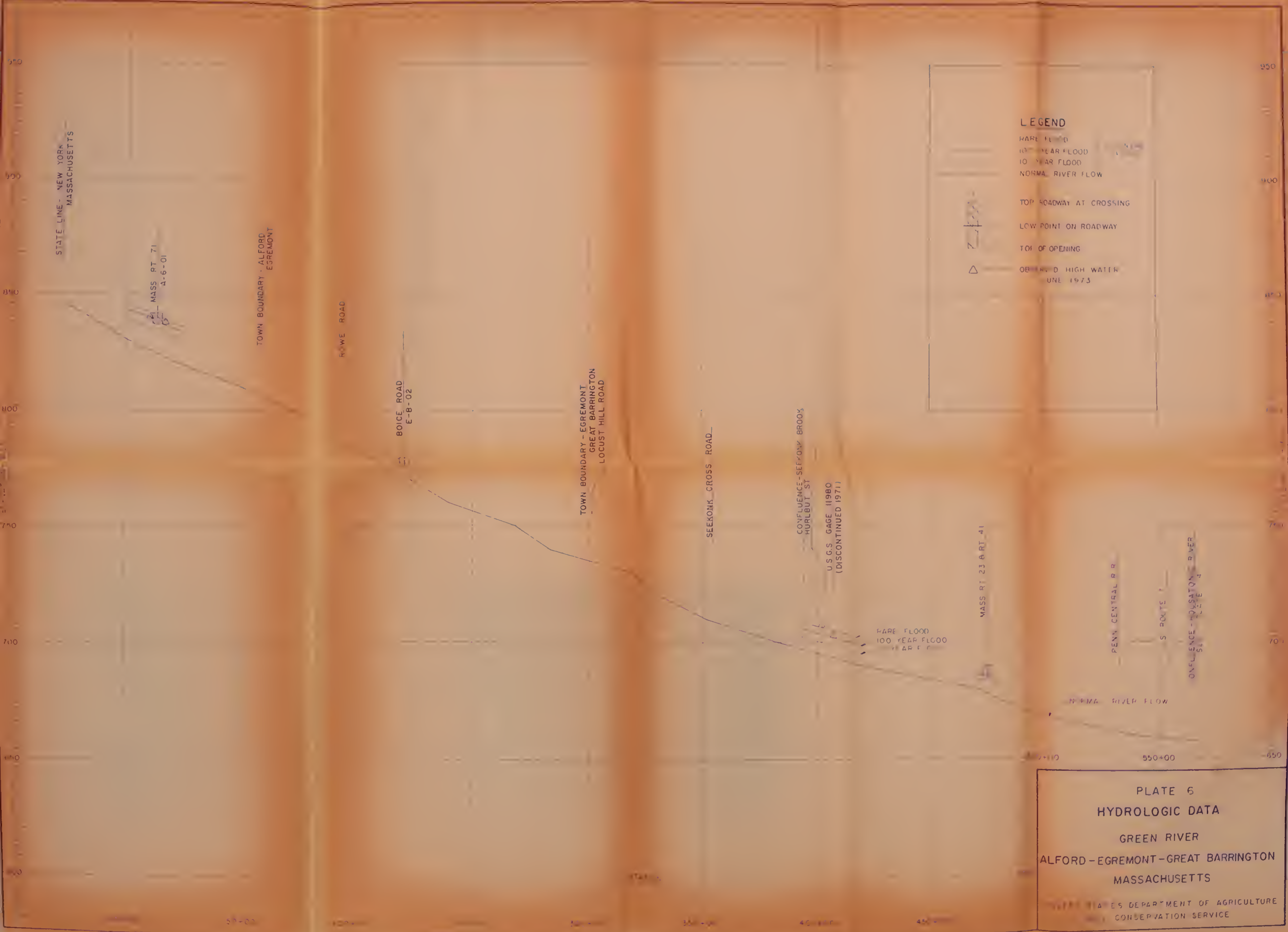


PLATE 6
HYDROLOGIC DATA
GREEN RIVER
ALFORD - EGREMONT - GREAT BARRINGTON
MASSACHUSETTS
UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

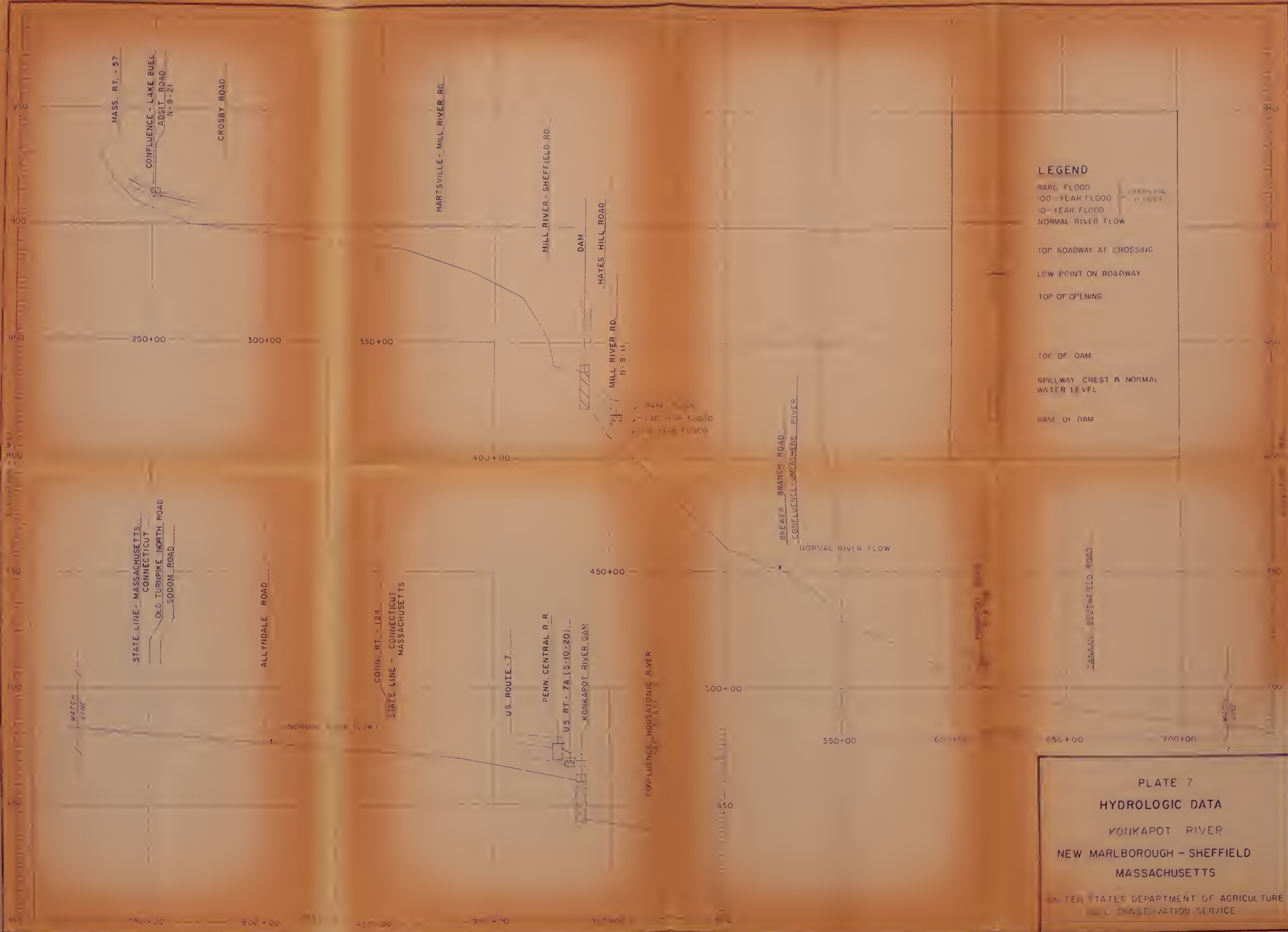


PLATE 7
HYDROLOGIC DATA
KONKAPOT RIVER
NEW MARLBOROUGH - SHEFFIELD
MASSACHUSETTS
UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

PLATE 8

INDEX MAP TO HYDROLOGIC DATA

HUDSON RIVER BASIN

MASSACHUSETTS

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

PLATE 9
HYDROLOGIC DATA
NORTH BRANCH HOOSIC RIVER
HUDSON BROOK
NORTH ADAMS—CLARKSBURG
MASSACHUSETTS

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

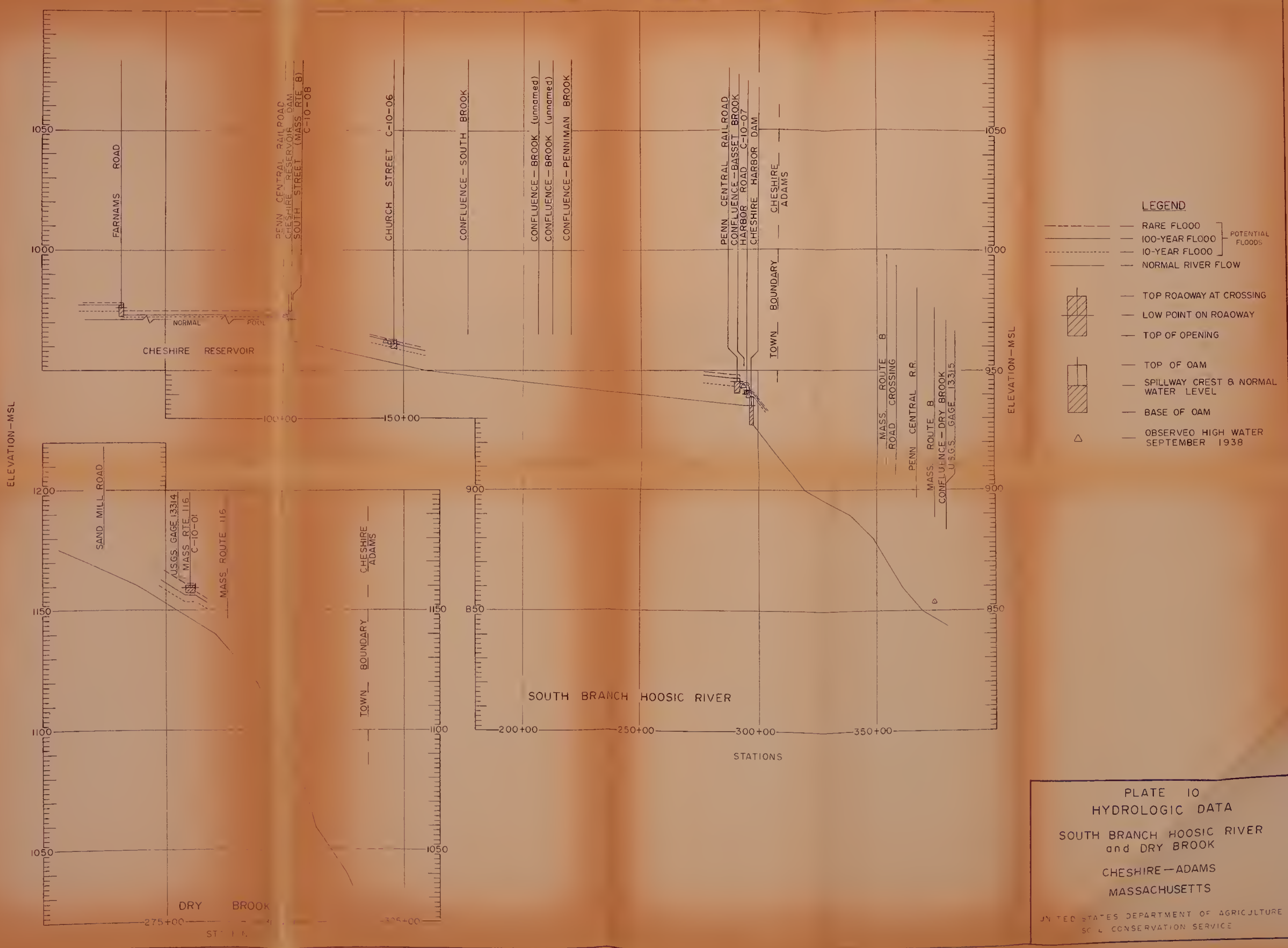


PLATE 10
HYDROLOGIC DATA
SOUTH BRANCH HOOSIC RIVER and DRY BROOK
CHESHIRE—ADAMS
MASSACHUSETTS

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

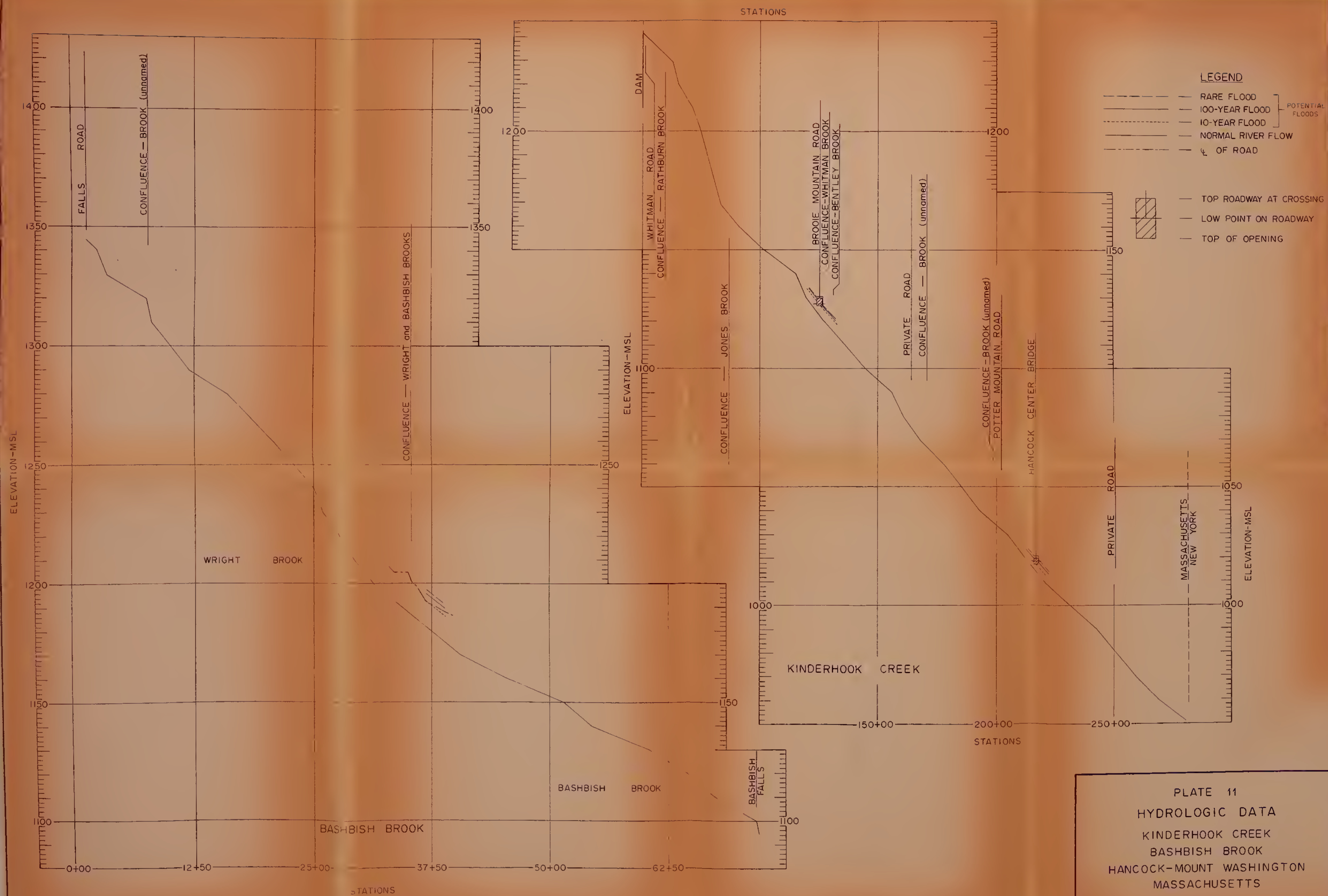


PLATE 11
HYDROLOGIC DATA
KINDERHOOK CREEK
BASHBISH BROOK
HANCOCK-MOUNT WASHINGTON
MASSACHUSETTS

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

BERKSHIRE REGION
MASSACHUSETTS

HYDROLOGIC DATA FOR SELECTED STREAM CROSSINGS [1]
HOUSATONIC STUDY AREA

TABLE 1
STREAM CROSSINGS
HOUSATONIC

STREAM CROSSING	PROFILE LOCATION / STATION	DRAINAGE AREA Sq. mi.	STREAM CROSSING DATA: TYPE	BRIDGE AREA [2] Sq. ft.	ELEVATION [3]: STREAM BOTTOM Feet	TOP of BRIDGE OPENING Feet	ROADWAY at CROSSING Feet	LOW POINT on ROADWAY Feet	POTENTIAL FLOOD DATA [4]: DISCHARGE [5]: 10-YEAR c.f.s.	100-YEAR c.f.s.	RARE c.f.s.	ELEVATION [6]: 10-YEAR Feet	100-YEAR Feet	RARE Feet
[illegible] RIVER														
[illegible] Street P-10-12	Plate 2 0-5	5[illegible]	[illegible]	[illegible]	[illegible]	971.0	[illegible]	[illegible]	28[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible] Avenue P-10-24	Plate 2 5-10	[illegible]	Concrete [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	52[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible] Road L- 7-01	Plate 2 20-25	146	Concrete [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5500	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible] Street L- 5-10	Plate 2 60-65	189	Concrete [illegible]	[illegible]	[illegible]	[illegible]	880.[illegible]	875.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible] Treatment Facilities	Plate 2 70-75	206	Stream [illegible]	[illegible]					[illegible]	[illegible]	[illegible]	[illegible].5	[illegible]	[illegible]
[illegible] Route [illegible] S-26-01	Plate 3 100-105	248	Concrete [illegible]	[illegible]	[illegible]	874.[illegible]	[illegible]	828.	[illegible]	[illegible]	[illegible]	822.[illegible]	[illegible]	[illegible]
[illegible] Route [illegible] G-11-05	Plate 3 140-145	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]28.2	733.1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]29.8	[illegible]
[illegible] Street G-11-12	Plate 3 150-155	280	[illegible]	[illegible]	80[illegible]	[illegible]	701.0	[illegible]	[illegible]500	[illegible]	[illegible]	[illegible]3.2	[illegible]95.4	[illegible]
[illegible] Street G-11-17	Plate 3 170-175	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]75.1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible] Route 7A S-10-02	Plate 4 235-240	468	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	65[illegible].1	[illegible]
[illegible] RIVER	Plate 5													
[illegible] Route 41 W-22-07	147+00	33	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	140	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible] Route 41 W-22-04	369+00	38	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible] Route 41 G-11-04	[illegible]+00	43	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Plate 6													
[illegible] Route 71 [illegible]-01	143+00	21	[illegible]	[illegible]	[illegible]	[illegible]	843.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible] Road [illegible]- 8-02	220+50	25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible] Gage [illegible]	407+25	[illegible]	[illegible]	[illegible]					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Plate [illegible]													
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible] - 8-09	[illegible]3+00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible] developed for planning use only; not [illegible]
[illegible] hydraulic flow area of [illegible] opening.
[illegible] Datum [illegible].
[illegible] under present watershed and flo[illegible]
[illegible] cubic feet per second.
[illegible] elevations computed [illegible] the upstream side of the str[illegible]

BERKSHIRE REGION
MASSACHUSETTS

HYDROLOGIC DATA FOR SELECTED STREAM CROSSINGS 1/
HUDSON STUDY AREA

TABLE 2
STREAM CROSSINGS
HUDSON

STREAM CROSSING	PROFILE LOCATION / STATION	DRAINAGE AREA SQ. MI.	TYPE	STREAM CROSSING DATA: BRIDGE AREA 2/ SQ. FT	STREAM CROSSING DATA: ELEVATION 3/ STREAM BOTTOM Feet	ELEVATION 3/ TOP of BRIDGE OPENING Feet	ELEVATION 3/ ROADWAY AT CROSSING Feet	ELEVATION 3/ LOW POINT ON ROADWAY Feet	POTENTIAL FLOOD DATA 4/: DISCHARGE 5/ 10-YEAR C.F.S	DISCHARGE 5/ 100-YEAR C.F.S.	DISCHARGE 5/ RARE C.F.S.	ELEVATION 6/ 10-YEAR Feet	ELEVATION 6/ 100-YEAR Feet	ELEVATION 6/ RARE Feet
[illegible]	[illegible]													
[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]
[illegible]														
[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]
[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]
[illegible]	[illegible]													
[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]		[illegible]		[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
[illegible]														
[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]
[illegible]	[illegible]													
[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]													
[illegible]	[illegible]		[illegible]											

[illegible]

HYDROLOGIC DATA FOR SELECTED DAMS 1/

DAM	PROFILE LOCATION / STATION	DRAINAGE AREA Sq. Mi.	DAM DATA: TYPE 2/	DAM DATA: HEIGHT Feet	DAM DATA: TOP ELEVATION 4/ Feet	DAM DATA: NORMAL POOL AREA Acres	SPILLWAY DATA: TYPE 3/	SPILLWAY DATA: SIZE Feet	SPILLWAY DATA: CREST ELEVATION 4/ Feet	SPILLWAY DATA: PRESENT CAPACITY 8/ CFS	POTENTIAL FLOOD DATA 5/ DISCHARGE 6/: 10-YEAR CFS	DISCHARGE 6/: 100-YEAR CFS	DISCHARGE 6/: RARE CFS	ELEVATION 7/: 10-YEAR Feet	ELEVATION 7/: 100-YEAR Feet	ELEVATION 7/: RARE Feet

APPENDIX B

Evaluation of Potential Reservoir Sites

B.1. Summary

The 87 potential reservoir sites which are presented in this appendix represent the prime possibilities for permanent water storage sites in the Berkshire Region. Topography, geology, and affected man-made facilities appear to be favorable. More detailed geologic and engineering investigations need to be made before sites are acquired. If future needs for a reservoir site in a particular area can be identified, steps should be taken to acquire the site at an early date so that development of the area does not make reservoir costs excessive. Early acquisition or protection of these potential reservoir sites is essential to conserve these important natural resources for future use.

B.2. Previous Studies

The Soil Conservation Service has completed and published inventories of potential reservoir sites for both the Housatonic and Hudson Study areas. The Hudson inventory is being revised and will be republished soon. Reservoir locations were selected on the basis of suitable topography, relatively undeveloped pool areas, and certain drainage area, pool area, and storage characteristics. Inventory data which was prepared included a surficial geologic investigation, list of man-made facilities which would be inundated and preliminary designs and cost estimates for various levels of development.

The inventories provide a valuable source of basic information about 189 potential reservoir sites in the region. No attempt was made in the inventories to evaluate the potential of the sites for specific purposes such as water supply, recreation, etc. Unfortunately, many of the sites which first appear promising fail to meet the more stringent criteria required for a good water supply or low-flow augmentation reservoir. Among the more common problems are poor geologic conditions, recent development of the pool area, and extremely high cost.

B.3. Site Evaluation

The purpose of this appendix is the presentation of the most promising potential reservoir sites in the Berkshire Region. The inventories of potential sites were used as the source of basic data. Many sites were quickly eliminated from further consideration because of obvious problems connected with geologic conditions and extensive effects on man-made facilities.

The remaining sites were individually evaluated for potential uses. Table B-1 summarized information for the sites which appear to have potential for permanent storage of water. More detailed information concerning the individual sites has been abstracted from the inventory of potential and existing reservoir sites and is presented in this appendix.

TABLE B-1 BERKSHIRE REGION
EVALUATION OF POTENTIAL RESERVOIR SITES FOR WATER SUPPLY,
LOW FLOW AUGMENTATION, WATER BASED RECREATION, FISH AND WILDLIFE 1/

Site No.	Location	Drainage Area	WATER SUPPLY 2/			LOW FLOW AUGMENTATION 3/			RECREATION 4/									FISH AND WILDLIFE 5/		
			Pool Elev.	Volume of Ben. Storage	Safe Yield	Pool Elev.	Volume of Ben. Storage	Low Flow for 120 days	Pool Elev.	Pool Area	Swim-ming	Pic-nick-ing	Camp-ing	Boating Motor	Boating Non-Motor	Hik-ing	Nature Study	Cold Water Fishing	Warm Water Fishing	Wat Fow Mar
	town/city	sq.mi.	ft.msl.	mil.gallons	mgd	ft.msl	ac. ft.	cfs	ft.msl	ac.										
101	Lanesborough	2.32	1250	360	1.4	1248	970	4.1	1266	112	G	G	G	G	E	G	G	F	F	P
107	Pittsfield	2.62	1130	430	1.6	1128	1150	4.8	1144	134	G	G	F	F	G	G	G	F	-	-
110	Pittsfield	1.99	1143	340	1.3	1141	870	3.7	1151	127	G	G	G	F	G	E	E	-	F	P
206	Pittsfield	0.95	1116	150	0.6	1115	430	1.8	1129	52	G	G	F	F	F	G	G	-	-	P
301	Windsor	0.88	1986	150	0.5	1984	380	1.6	1991	56	E	E	G	G	E	E	E	-	F	P
303	Windsor	1.76	1899	300	1.1	1897	740	3.1	1902	112	G	G	G	G	E	G	E	-	F	F
305	Windsor	3.54	1874	570	2.2	1872	1490	6.3	1886	220	E	G	G	G	E	G	G	-	F	F
307	Windsor	7.01	1801	1110	4.2	1798	3100	13.0	1819	164	E	G	G	G	E	G	E	G	F	P
310	Hinsdale	3.59	1568	580	2.2	1565	1550	6.5	1584	107	G	E	G	G	E	E	E	G	F	-
311	Hinsdale	2.53	1639	270	1.2	1639	830	3.5	1639	45	G	G	G	F	G	G	G	-	F	P
312	Peru	1.47	1899	230	0.9	1898	660	2.8	1912	87	E	G	G	G	E	G	G	-	F	P
317	Hinsdale	1.65	1553	280	1.0	1551	740	3.1	1568	82	G	G	G	G	E	E	E	F	F	-
319	Hinsdale	17.9	1435	860	5.3	1435	2640	11.1	1435	730	E	P	P	G	G	F	E	-	G	G
320	Hinsdale	2.65	1539	430	1.6	1539	1330	5.6	1539	71	G	F	P	P	F	P	P	F	F	P
321	Peru	0.85	1559	140	0.5	1558	390	1.6	1569	52	G	G	F	P	G	G	G	F	F	P
323	Washington	0.70	1811	110	0.4	1810	310	1.3	1817	45	G	G	G	F	E	E	E	F	F	P
324	Hinsdale	1.56	1558	250	0.9	1556	670	2.8	1564	48	G	G	F	P	E	F	F	F	F	P
325	Hinsdale	3.49	1445	390	1.7	1445	1200	5.0	1445	216	E	P	P	E	E	P	F	-	G	G
326	Peru	0.90	1575	150	0.5	1573	390	1.6	1588	51	G	G	G	F	E	E	E	F	F	P
502	Lenox	2.71	1159	430	1.6	1158	1200	5.0	1159	110	G	G	G	F	E	E	E	-	G	F
503	Lenox	4.08	1129	170	1.1	1129	520	2.2	1129	110	G	G	G	F	G	E	E	-	G	F
504	Lenox	5.01	1074	810	3.0	1070	2150	9.0	1079	102	G	G	F	F	F	G	G	G	G	F
506	Washington	4.10	1832	710	2.5	1830	1750	7.3	1834	262	E	G	G	G	E	E	E	G	G	F
507	Washington	3.24	1840	550	2.0	1839	1470	6.2	1839	207	G	E	G	G	E	G	G	-	G	G
508	Washington	1.72	1902	280	1.0	1901	720	3.0			PRESENT WATER SUPPLY									
510	Washington	1.02	1913	160	0.6	1912	450	1.9	1915	65	G	G	G	F	G	E	E	-	G	F
601	Stockbridge	0.90	922	140	0.5	921	390	1.7	933	57	F	G	F	P	F	G	G	F	F	P
604	Stockbridge	1.08	982	150	0.6	982	470	2.0	978	68	P	F	F	P	P	F	F	-	F	F
606	Stockbridge	3.91	955	620	2.3	954	1700	7.1	959	250	G	G	G	G	E	G	G	-	G	G
607	Lenox	2.01	1044	300	1.2	1044	930	3.9	1040	128	P	F	F	P	P	F	F	-	G	F

1/ Levels of development presented here were selected to illustrate the maximum potential for each use.
2/ Water supply is based on a safe yield of 0.6 million gallons per day per square mile of drainage area or the maximum safe yield of the site; whichever is less.
3/ Low flow augmentation is based on 8 inches of runoff volume from the drainage area, or the maximum storage available; whichever is less.
4/ Evaluations for recreation were done by the Massachusetts Division of Forests and Parks. Ratings are: E-Excellent, G-Good, F-Fair, and P-Poor.
5/ Evaluations for fish and wildlife were done by the Massachusetts Division of Fisheries and Wildlife. Ratings used are: G-Good, F-Fair, P-Poor, and no rating, which indicates site is unsuited for this use.

TABLE B-1 BERKSHIRE REGION (continued)
EVALUATION OF POTENTIAL RESERVOIR SITES FOR WATER SUPPLY, LOW FLOW AUGMENTATION, WATER BASED RECREATION, FISH AND WILDLIFE 1/

Site No.	Location town/city	Drainage Area sq.mi.	WATER SUPPLY 2/ Pool Elev. ft.msl	Volume of Ben. Storage mil.gallons	Safe Yield mgd	LOW FLOW AUGMENTATION 3/ Pool Elev. ft.msl	Volume of Ben. Storage ac. ft.	Low Flow for 120 days cfs	Pool Elev. ft.msl	Pool Area ac.	RECREATION 4/ Swimming	Picnicking	Camping	Boating Motor	Boating Non-Motor	Hiking	Nature Study	FISH AND WILDLIFE 5/ Cold Water Fishing	Warm Water Fishing	Water Fowl Marsh
608	Lenox	2.18	972	360	1.4	971	1000	4.2	983	135	G	G	F	P	G	G	F	-	G	F
616	Tyringham	1.79	1560	300	1.1	1559	830	3.5	1564	107	G	G	G	F	G	G	G	-	G	F
622	Stockbridge	0.98	906	160	0.6	905	430	1.8	912	63	PRESENT WATER SUPPLY									
801	Tyringham	18.7	875	920	5.6	875	2820	11.8	875	173	F	G	P	P	P	G	G	-	G	F
802	Tyringham	13.8	942	1410	6.6	942	4320	18.1	942	424	E	G	G	G	E	E	E	-	G	G
803	Tyringham	4.71	992	750	2.8	988	2000	8.4	992	80	G	G	F	P	G	E	E	G	G	F
903	Stockbridge	11.1	832	1740	6.7	831	4730	19.9	837	712	F	G	G	P	F	G	G	-	G	G
904	Great Barrington	1.32	1660	210	0.8	1659	580	2.4	1672	73	G	G	G	G	E	E	E	-	F	P
905	Great Barrington	2.47	1662	400	1.5	1660	1080	4.5	1662	78	F	G	G	P	F	G	G	F	F	P
906	Great Barrington	1.49	1700	250	0.9	1698	680	2.8	1712	95	G	G	G	G	E	E	E	F	F	P
908	Great Barrington	2.50	1639	400	1.5	1637	1110	4.7	1655	138	G	G	G	G	E	E	E	G	F	P
1001	Richmond	2.30	1133	360	1.4	1132	1000	4.2	1118	23	F	G	F	P	P	G	G	-	F	-
1003	Richmond	4.87	1062	460	2.2	1062	1410	5.9	1062	132	F	F	P	P	F	F	F	-	G	F
1004	Lenox	1.18	1477	220	0.7	1475	530	2.2	1492	52	PRESENT WATER SUPPLY									
1005	Richmond	3.16	1062	500	1.9	1060	1350	5.7	1061	95	F	G	G	P	F	E	E	F	F	P
1007	West Stockbridge	9.91	979	1580	5.9	975	4280	18.0	1002	198	F	F	P	P	P	F	F	F	F	-
1010	West Stockbridge	5.07	940	810	3.0	938	2220	9.3	939	134	F	F	P	P	P	F	F	-	G	P
1107	Alford	11.8	867	1880	7.1	865	5260	22.1	890	390	F	G	G	P	P	G	G	F	G	P
1204	Sheffield	20.5	687	3270	12.3	686	9020	37.9	690	1185	F	G	G	P	F	E	E	-	G	G
1205	Sheffield	2.69	716	460	1.7	715	1270	5.3	719	172	G	G	G	G	E	G	G	-	G	F
1208	Sheffield	5.32	913	840	3.2	912	2330	9.8	917	340	E	G	G	G	E	E	E	-	G	F
1210	Sheffield	4.04	926	670	2.5	925	1840	7.7	934	258	G	G	G	G	E	E	E	-	G	F
1211	Sheffield	2.26	960	380	1.4	958	1050	4.4	959	61	G	G	G	G	E	G	G	-	F	P
1216	Sheffield	18.5	698	3010	11.3	696	7990	33.6	711	890	F	G	G	P	F	E	E	-	G	P
1219	Sheffield	1.48	808	230	0.9	808	710	3.0	810	95	F	G	F	P	F	G	G	-	F	P
1302	Egremont	1.58	855	250	0.9	855	780	3.3	851	101	F	G	G	P	G	G	G	-	G	F
1310	Sheffield	1.05	685	170	0.6	684	450	1.9	687	66	G	G	G	F	G	E	E	-	F	P
1311	Sheffield	25.4	680	630	4.9	680	1930	8.1	674	165	G	G	G	G	E	G	G	-	F	P
1312	Sheffield	4.53	693	260	1.5	693	790	3.3	693	210	F	E	G	P	F	E	E	-	F	F

1/ Levels of development presented here were selected to illustrate the maximum potential for each use.
2/ Water supply is based on a safe yield of 0.6 million gallons per day per square mile of drainage area or the maximum safe yield of the site; whichever is less.
3/ Low flow augmentation is based on 8 inches of runoff volume from the drainage area, or the maximum storage available; whichever is less.
4/ Evaluations for recreation were done by the Massachusetts Division of Forests and Parks. Ratings are: E-Excellent, G-Good, F-Fair, and P-Poor.
5/ Evaluations for fish and wildlife were done by the Massachusetts Division of Fisheries and Wildlife. Ratings used are: G-Good, F-Fair, P-Poor, and no rating, which indicates site is unsuited for this use.

TABLE B-1 BERKSHIRE REGION (continued)
EVALUATION OF POTENTIAL RESERVOIR SITES FOR WATER SUPPLY,
LOW FLOW AUGMENTATION , WATER BASED RECREATION , FISH AND WILDLIFE 1/

Site No.	Location	Drainage Area	WATER SUPPLY 2/			LOW FLOW AUGMENTATION 3/				RECREATION 4/								FISH AND WILDLIFE 5/		
			Pool Elev.	Volume of Ben. Storage	Safe Yield	Pool Elev.	Volume of Ben. Storage	Low Flow for 120 days	Pool Elev.	Pool Area				Boating				Cold Water Fishing	Warm Water Fishing	Water Fowl Marsh
	town/city	sq.mi.	ft.msl	mil.gallons	mgd	ft.msl	ac.ft.	cfs	ft.msl	ac.	Swimming	Picnicking	Camping	Motor	Non-Motor	Hiking	Nature Study			
HO 1402	Monterey	1.03	1208	160	0.6	1207	450	1.9	1214	65	G	G	G	F	G	E	E	-	F	P
1403	Monterey	1.08	1276	180	0.7	1274	480	2.0	1274	32	G	G	G	G	G	G	G	-	F	-
1404	Monterey	1.33	1307	210	0.8	1304	570	2.4	1328	47	G	G	G	G	G	E	E	F	F	-
1405	Monterey	8.95	1206	1450	5.5	1202	3830	16.1	1236	240	F	G	G	P	F	E	E	F	F	-
1406	Monterey	7.81	1243	1250	4.7	1241	3410	14.3	1261	302	G	G	G	G	E	E	E	-	G	F
1408	New Marlborough	1.62	1015	260	1.0	1011	710	3.0	1019	28	F	G	G	P	P	G	G	F	-	-
1410	New Marlborough	0.95	1337	150	0.6	1335	400	1.7	1351	53	G	G	G	G	G	G	G	-	F	-
1411	Monterey	1.34	1458	210	0.8	1457	710	3.0	1454	38	G	G	G	G	G	G	G	-	F	-
1412	New Marlborough	2.81	1455	120	0.8	1455	370	1.6	1452	29	G	G	G	F	G	G	G	-	-	-
1413	New Marlborough	1.79	1517	280	1.1	1516	790	3.3	1509	33	G	G	G	F	E	E	E	-	-	-
1414	New Marlborough	0.96	1492	150	0.6	1491	420	1.8	1498	61	G	G	G	F	E	G	G	-	F	P
1417	New Marlborough	2.02	1077	330	1.2	1075	930	3.9	1092	53	F	G	G	P	F	P	G	-	F	-
1502	New Marlborough	1.78	1427	290	1.1	1425	760	3.2	1437	113	G	G	G	G	E	E	E	-	G	G
1504	New Marlborough	8.80	1197	1390	5.3	1195	3860	16.2	1193	192	G	G	G	G	G	G	G	-	G	F
1505	New Marlborough	1.76	1189	280	1.1	1188	790	3.3	1201	104	G	G	G	G	E	G	G	-	G	F
HU 0102	Cheshire	0.91	1114	200	0.5	1107	410	1.7	1130	50	G	G	G	F	G	G	G	G	-	-
0106	Windsor	2.00	1845	440	1.2	1839	830	3.5	1856	130	G	F	F	F	G	G	G	F	F	P
0108	Cheshire	6.97	1170	1060	3.6	1170	3260	13.7	1173	137	G	P	P	G	G	G	G	G	F	P
0111	Lanesborough	1.71	989	360	1.0	986	750	3.2	986	107	P	F	G	P	G	F	F	-	G	F
0112	Lanesborough	0.95	1050	200	0.6	1045	430	1.8	1063	55	F	P	G	P	G	G	G	F	F	-
0204	North Adams	2.21	1285	370	1.2	1279	950	4.0		PRESENT WATER SUPPLY RESERVOIR										
0301	Clarksburg	1.41	1846	300	0.9	1837	580	2.4	1860	52	G	F	F	G	G	G	G	G	-	-
0405	New Ashford	1.98	1299	440	1.2	1290	890	3.7	1309	63	G	G	G	F	G	G	G	G	-	-
0504	Hancock	0.88	1147	180	0.5	1142	380	1.6	1157	48	F	F	F	P	G	G	G	F	-	-
0601	Mt. Washington	1.19	1612	250	0.7	1608	540	2.3	1613	65	F	G	G	P	G	G	G	-	-	-
0602	Mt. Washington	3.06	1586	680	1.9	1575	1340	5.6	1586	83	G	G	G	G	G	G	G	G	F	-
0603	Mt. Washington	1.15	1618	250	0.7	1611	510	2.1	1632	67	G	G	G	G	G	G	G	F	F	-
0606	Mt. Washington	1.55	1828	330	0.9	1820	690	2.9	1843	60	G	G	G	G	G	G	G	F	-	-

1/ Levels of development presented here were selected to illustrate the maximum potential for each use.
2/ Water supply is based on a safe yield of 0.6 million gallons per day per square mile of drainage area or the maximum safe yield of the site; whichever is less.
3/ Low flow augmentation is based on 8 inches of runoff volume from the drainage area, or the maximum storage available; whichever is less.
4/ Evaluations for recreation were done by the Massachusetts Division of Forests and Parks. Ratings are: E-Excellent, G-Good, F-Fair, and P-Poor.
5/ Evaluations for fish and wildlife were done by the Massachusetts Division of Fisheries and Wildlife. Ratings used are: G-Good, F-Fair, P-Poor, and no rating, which indicates site is unsuited for this use.

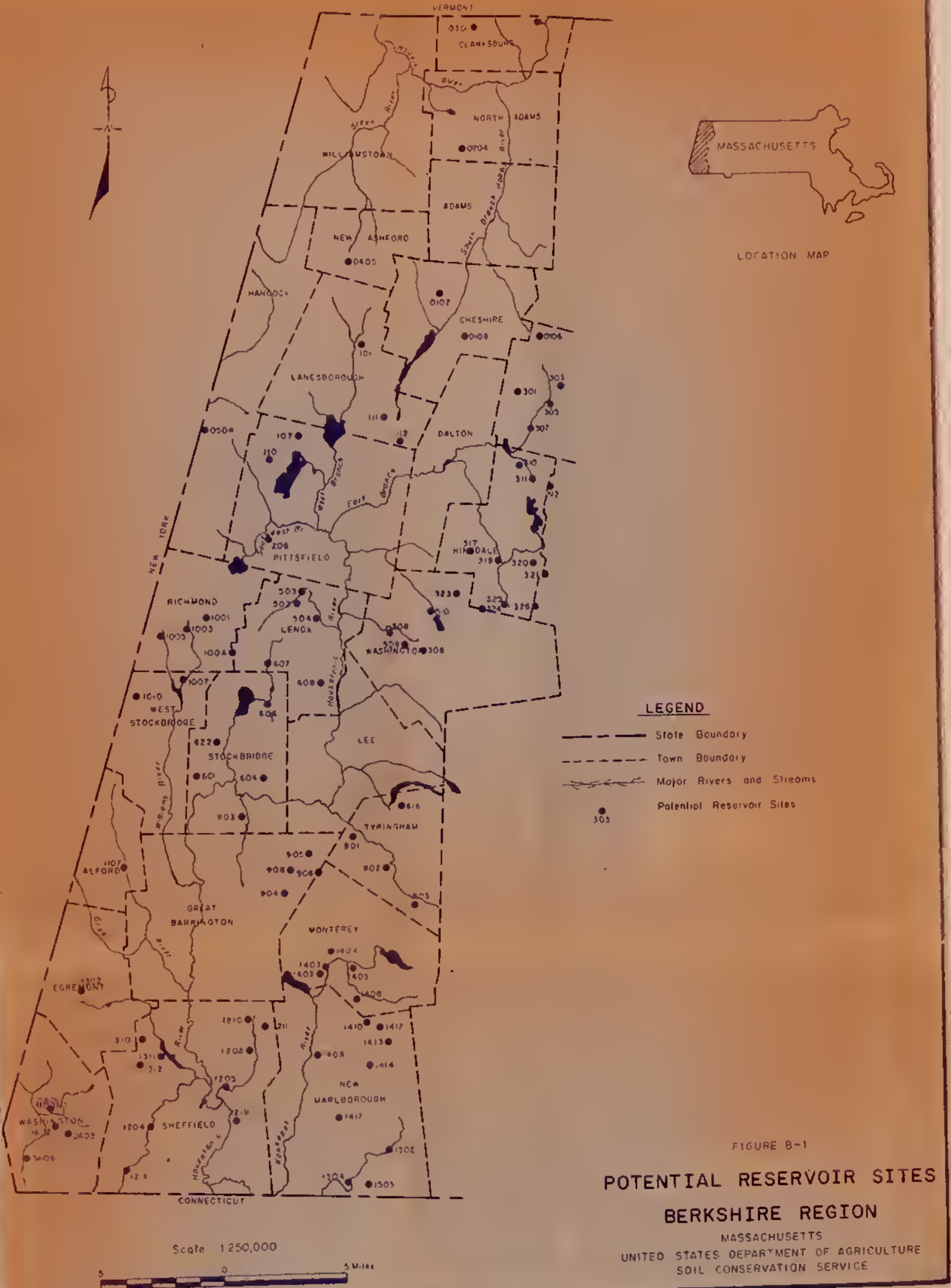


FIGURE B-1

POTENTIAL RESERVOIR SITES

BERKSHIRE REGION

MASSACHUSETTS

UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

APPENDIX C

List of Ponds, Lakes and Reservoirs

will be furnished later

MASSACHUSETTS WATER RESOURCES STUDY

BERKSHIRE REGION

APPENDIX D

The references listed are organized by chapter headings such as Flooding or Land Use. To avoid duplication the references are only listed under one chapter heading. There are a number of these references which could be listed under more than one heading.

APPENDIX D

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